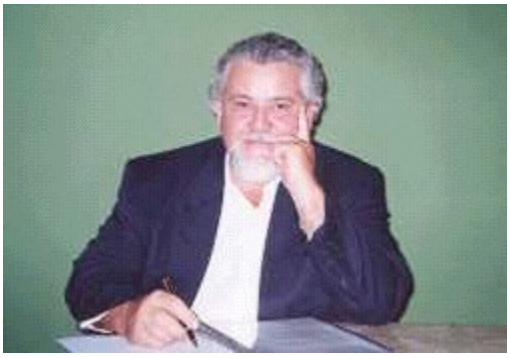
Fran De AQUINO Gravitational Spacecraft

Fran de Aquino



Professor Fran De Aquino's Webpage -- http://www.frandeaquino.org/
http://users.elo.com.br/~deaquino/

Physics Department, Maranhao State University
deaquino@uema.br

---

http://xxx.lanl.gov/abs/gr-qc/9910036v1
http://xxx.lanl.gov/find/gr-qc/1/au:+Aquino_F/0/1/0/all/0/1

Gravitation and Electromagnetism : Correlation and Grand Unification

by

Fran De Aquino
(Maranhao State University, Brazil)

It is demonstrated that gravitational and inertial masses are correlated by an electromagnetic factor. From the practical point of view this is very important because it means the possibility of electromagnetic control of the gravity. Some theoretical consequences of the correlation are:

incorporation of Mach's principle into Gravitation Theory;
new relativistic expression for the mass ;
the generalization of Newton's second law for the motion;
the deduction of the differential equation for entropy directly from the Gravitation Theory.

Another fundamental consequence of the mentioned correlation is that, in specific ultra-high energy conditions, the gravitational and electromagnetic fields can be described by the same

Hamiltonian, i.e., in these circumstances, they are unified ! Such conditions can have occurred inclusive in the Initial Universe, before the first spontaneous breaking of symmetry.

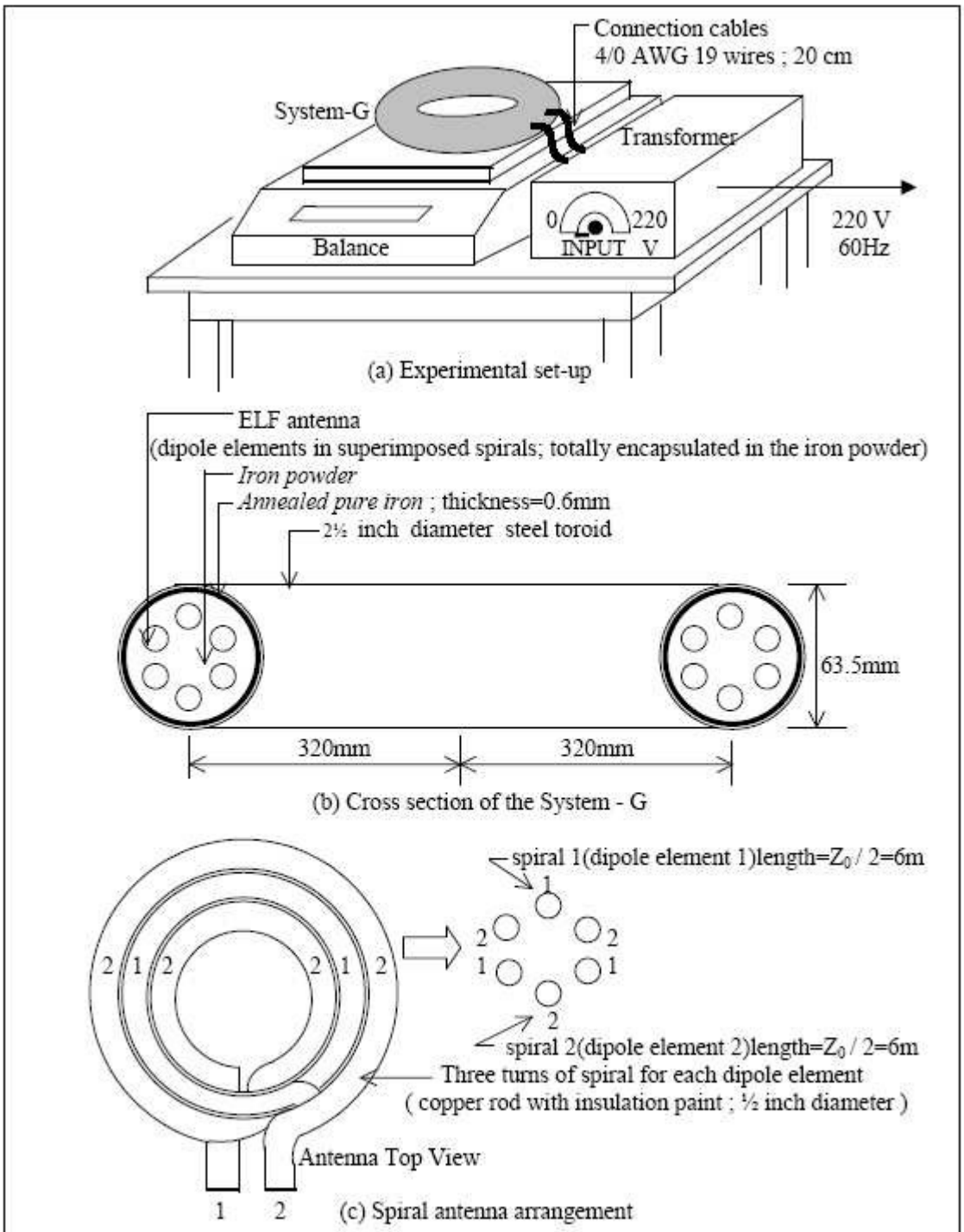


Fig. 1 – Schematic View of the Experimental Apparatus

JLN Labs
March 21th, 2000
Email : JNaudin509@aol.com
JLN Lab's eGroup at : jlnlabs@egroups.com if you are a team member.

The Gravitational SpaceCraft from Fran De Aquino

Warping to the deep space...

by

Fran De Aquino

== g-craftpn.jpg

It is known that photons have null inertial mass (mi = 0) and that they do not absorb others photons (U = 0). So , if we put mi = 0 and U = 0 in Eq.(1.04), the result is mg = 0. Therefore photons have null gravitational mass. Let us consider a point source of radiation with power P , frequency f and radiation density at distance r given by D = P /4p r2

Due to the null gravitational mass of the photons, it must be possible to build a shield of photons around the source, which will impede the exchange of gravitons between the particles inside the shield and the rest of the Universe. The shield begins at distance rs from the source where the radiation density is such that there will be a photon in opposition to each incident graviton . This critical situation occurs when D = hf 2 / Sg , where Sg is the geometric cross section of the graviton. Thus rs is given by the relation, rs = (rg / f)(P/h)1/2

== eq1u104.gif

$$(1.04)\ m_g = m_i - 2\left\{\left[1+\left[U/m_i c^2\left[\tfrac{1}{2}e_r m_r\left[(1+(s/we)^2)^{1/2}+1\right]\right]^{1/2}\right]^2\right]^{1/2}-1\right\}m_i$$

We then see that the ELF radiation are the most appropriate to produce the shield. It can be easily shown that, if f << 1mHz , the radiation will traverse any particle . It is not difficult to see that in this case, there will be "clouds" of photons around the particles inside the shield. Due to the null gravitational mass of the photons , these "clouds" will impede the exchange of gravitons between the particle inside the "cloud" and the rest of the Universe. Thus, we can say that the gravitational mass of the particle will be null with respect to the Universe, and that the space-time inside the shield (out of the particles) becomes flat or euclidean . It is clear that the space-time which the particles occupies remains non-euclidean.

In an euclidean space-time the maximum speed of propagation of the interactions is infinite

== cinf.gif

$$(c \to \infty)$$

because , as we know, the metrics becomes from Galilei.

Therefore, the interactions are instantaneous . Thus , in this space-time the speed of photons must be infinite, simply because they are the quanta of the electromagnetic interaction. So, the speed of photons will be infinite inside the shield.

On the other hand , the new relativistic expression for mass, Eq.(2.06),

== equ206.gif

$$(2.06)\quad |M_g| = |m_g| \left[1 - V^2/c^2\right]^{-1/2}$$

shows that a particle with null gravitational mass isn't submitted to the increase of relativistic mass, because under these circumstances its gravitational mass doesn't increase with increasing velocity .i.e., it remains null independently of the particle's velocity. In addition , the gravitational potential

-== phigm.gif

$$\varphi = GM_g/r$$

or the particle will be null and, consequently , the component

== goophi.gif

$$g_{00} = -1 - 2\varphi/c^2$$

of the metric tensor will be equal to -1.

Thus , we will have

== ds2goo.gif

$$ds^2 = g_{00}(dx_0)^2 = g_{00}(icdt')^2 = c^2(dt')^2$$

where t' is the time in a clock moving with the particle , and ds2 = c2 dt2 where t is the time indicated by a clock at rest (dx = dy = dz = 0).

From the combination of these two equations we conclude that t' = t .This means that the particle will be not more submitted to the relativistic effects predicted in Einstein's theory. So, it can reach and even surpass the speed of light . We can imagine a spacecraft with positive

gravitational mass qual to (m) kg , and negative gravitational mass (see System-G in appendix A) equal to - (m - 0.001) kg . It has a shield of photons , as above mentioned. If the photons, which produce the shield , radiate from the surface of the spacecraft , then the space-time that it occupies remains non-euclidean ,and consequently , for an observer in this space-time , the total gravitational mass of the spacecraft, will be

== mg001.gif

$$|M_g| = 0.001\ \text{kg}$$

. Therefore , if its propulsion system produces F=10N (only) the spacecraft acquires acceleration

== aequalf.gif

$$a = F/|M_g| = 10^4\ \text{m/s}$$

(see Eq.(2.05)).

== equ205.gif

$$(2.05)\quad \boldsymbol{F} = |M_g|\,\boldsymbol{a}$$

Furthermore, due to the "cloud" of photons around the spacecraft its gravitational interaction with the Universe will be null , and therefore, we can say that its gravitational mass will be null with respect to the Universe. Consequently, the inertial forces upon the spacecraft will also be null, in agreement with Eq.2.05 (Mach's principle).This means that the spacecraft will lose its inertial properties . In addition, the spacecraft will can reach and even surpass the speed of light because , as we have seen , a particle with null gravitational mass will be not submitted to the relativistic effects.

Fran De Aquino, April 20th, 2000

JLN Labs

The System-G from Fran De Aquino : Engineering the device...

by

Fran De Aquino and Steve Burns

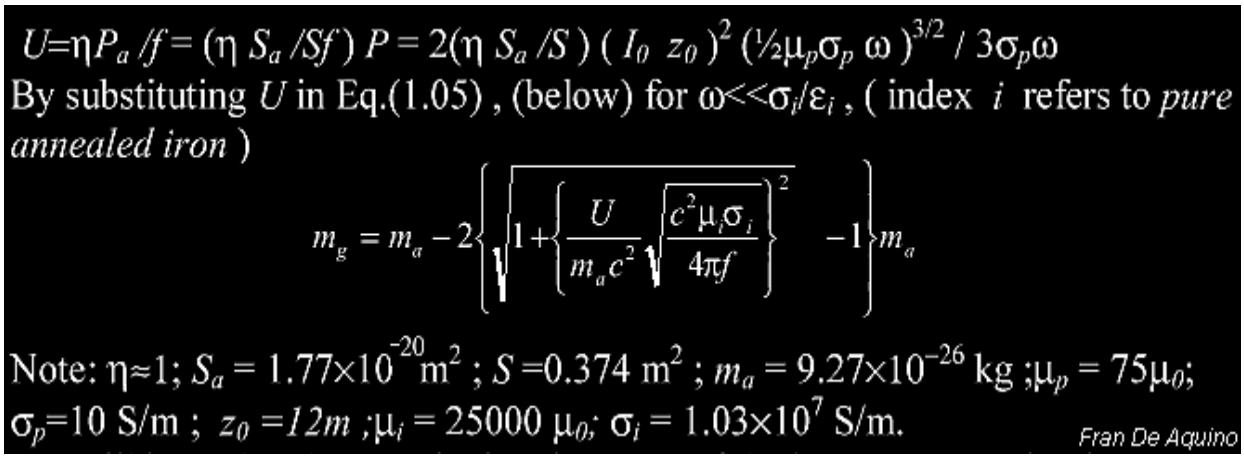
March 17th, 2000

The System-G experiment has been performed successfuly by Fran De Aquino on January 27th,

2000 at the Physics Department of Maranhao State University in Brazil.

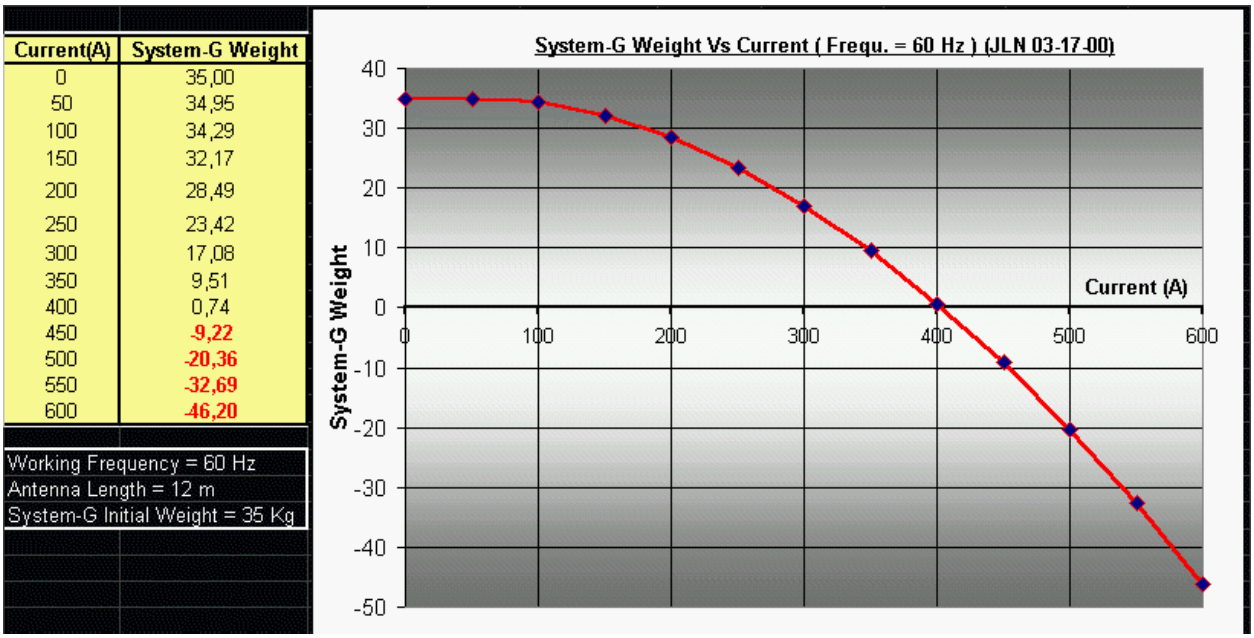
In the System-G torus, the ELF energy generated by the dipole antenna must be fully absorbed the atoms of the annealed iron lamina. The ELF energy is done by this equation below :

== sysg104.gif


$U=\eta P_a/f=(\eta S_a/Sf)\,P=2(\eta S_a/S)(I_0\ z_0)^2(\tfrac{1}{2}\mu_p\sigma_p\omega)^{3/2}/3\sigma_p\omega$
By substituting U in Eq.(1.05) , (below) for $\omega<<\sigma_i/\varepsilon_i$, (index i refers to *pure annealed iron*)
$m_g=m_a-2\left\{\sqrt{1+\left\{\frac{U}{m_a c^2}\sqrt{\frac{c^2\mu_i\sigma_i}{4\pi f}}\right\}^2}-1\right\}m_a$
Note: $\eta\approx1$; $S_a=1.77\times10^{-20}\ m^2$; $S=0.374\ m^2$; $m_a=9.27\times10^{-26}$ kg ; $\mu_p=75\mu_0$; $\sigma_p=10$ S/m ; $z_0=12m$; $\mu_i=25000\ \mu_0$; $\sigma_i=1.03\times10^7$ S/m.
Fran De Aquino

The curve below, shows that a System-G weight (35 Kg) can be nullified at 60Hz with a current of 400 Ampere.

== sysgcur.gif



Current(A)	System-G Weight
0	35,00
50	34,95
100	34,29
150	32,17
200	28,49
250	23,42
300	17,08
350	9,51
400	0,74
450	-9,22
500	-20,36
550	-32,69
600	-46,20

Working Frequency = 60 Hz
Antenna Length = 12 m
System-G Initial Weight = 35 Kg

The use of the power grid for the basic System-G experiment has been conducted easily by using the power grid frequency (60 Hz, in Brazil), this was energy consumming (about 11 KW). But

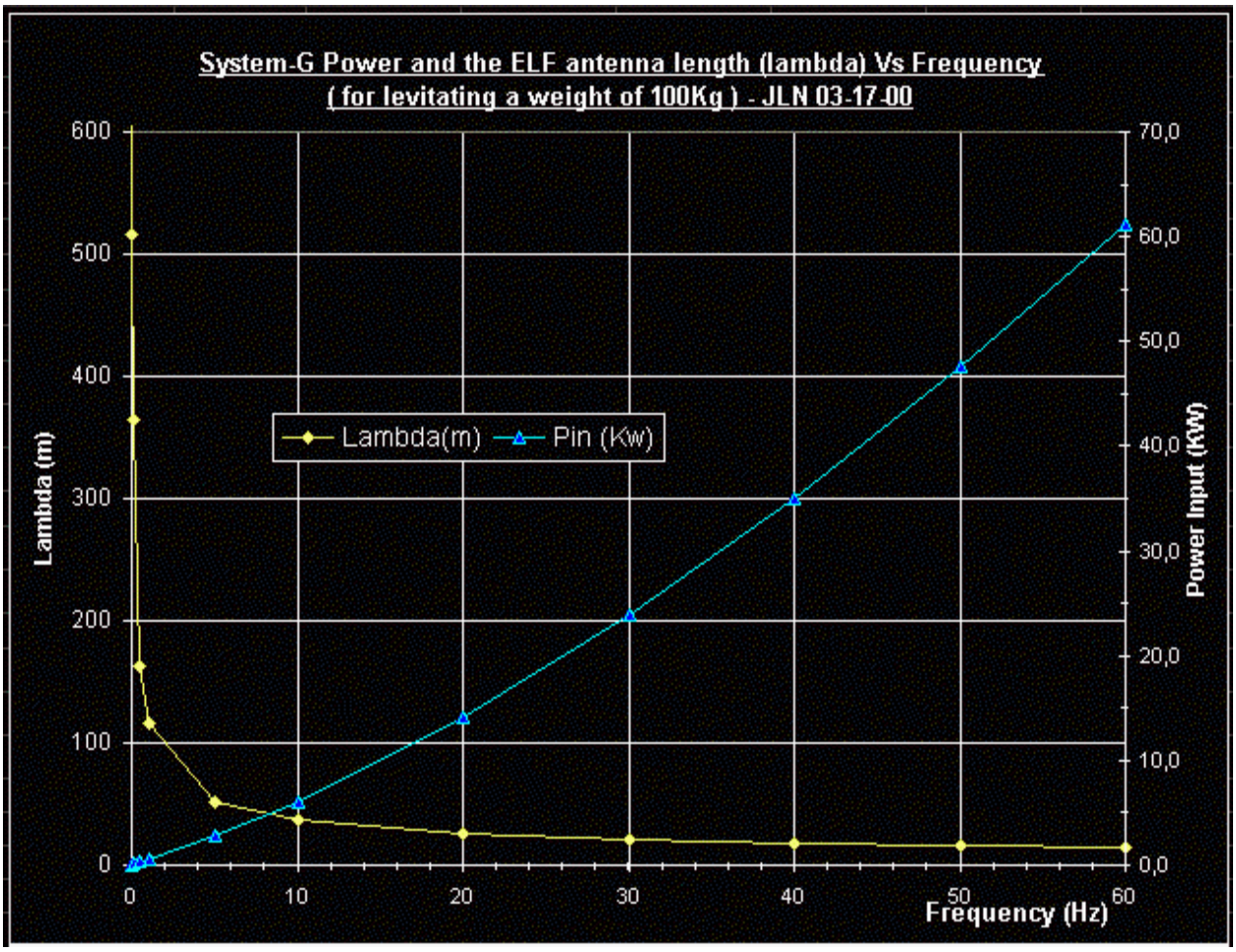
for improving the efficiency of the whole apparatus, Power Input Vs weight lifted, its seems much adapted to use a lower frequency than previously for the ELF signal as shown on the table below :

== sysgpwr2.gif

Conditions required for levitating 100 Kg			
Freq (Hz)	Current (A)	Lambda(m)	Pin (Kw)
0,01	28,32	1155,0	0,032
0,05	43,12	516,5	0,080
0,1	52,00	365,2	0,123
0,5	82,24	163,3	0,367
1	101,85	115,5	0,632
5	178,15	51,7	2,829
10	235,00	36,5	6,088
20	318,00	25,8	14,166
30	382,70	21,1	23,871
40	438,60	18,3	35,069
50	488,50	16,3	47,562
60	533,8	14,9	61,174
This diagram shows that the power input requirement drops dramatically with the ELF frequency used.This is the power input required for nullifying the weight of a System-G of 100 KG.			
JLN upd 03-17-00			

You notice that, to levitate a 100 Kg weight apparatus,
at 60 Hz we need 61 KW and for the same results, only 632 W is required at 1 Hz.

== sysgpwr.gif

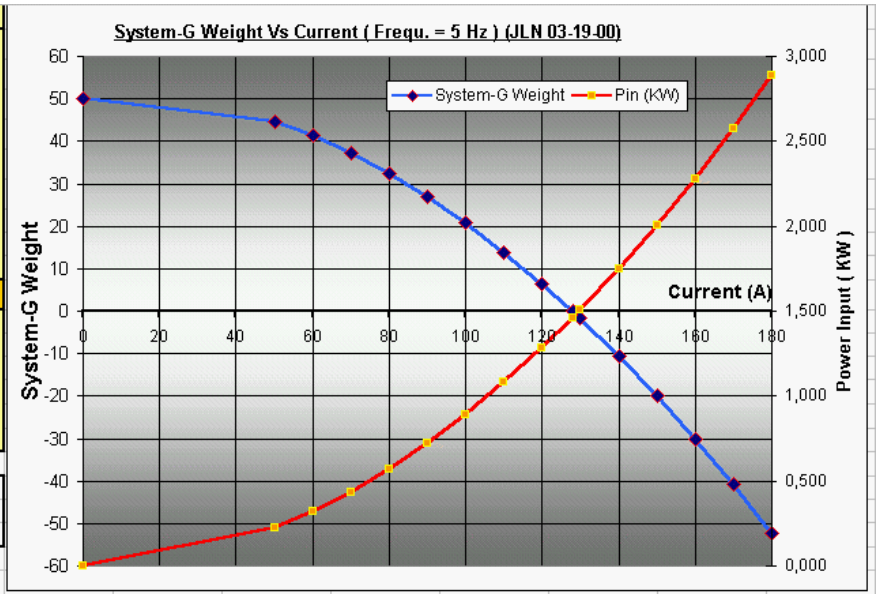


== sysg5hz.gif

Current(A)	System-G Weight	Pin (KW)
0	50,00	0,000
50	44,60	0,223
60	41,30	0,321
70	37,20	0,437
80	32,40	0,570
90	26,90	0,722
100	20,70	0,891
110	13,90	1,079
120	6,50	1,284
128	0,00	1,460
130	-1,70	1,506
140	-10,50	1,747
150	-19,90	2,006
160	-30,00	2,282
170	-40,80	2,576
180	-52,20	2,888

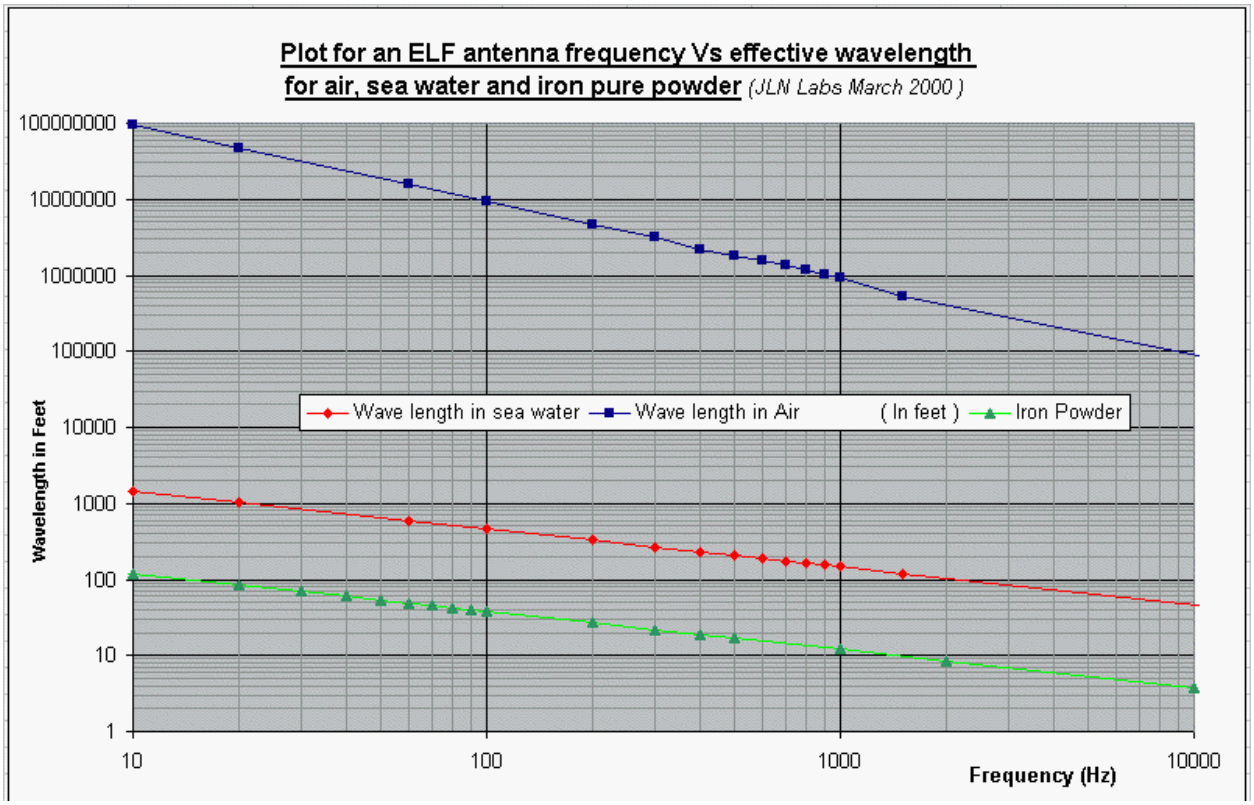
Working Frequency = 5 Hz
Antenna Length = 51,7 m
System-G Initial Weight = 50 Kg

JL Naudin 03-19-00



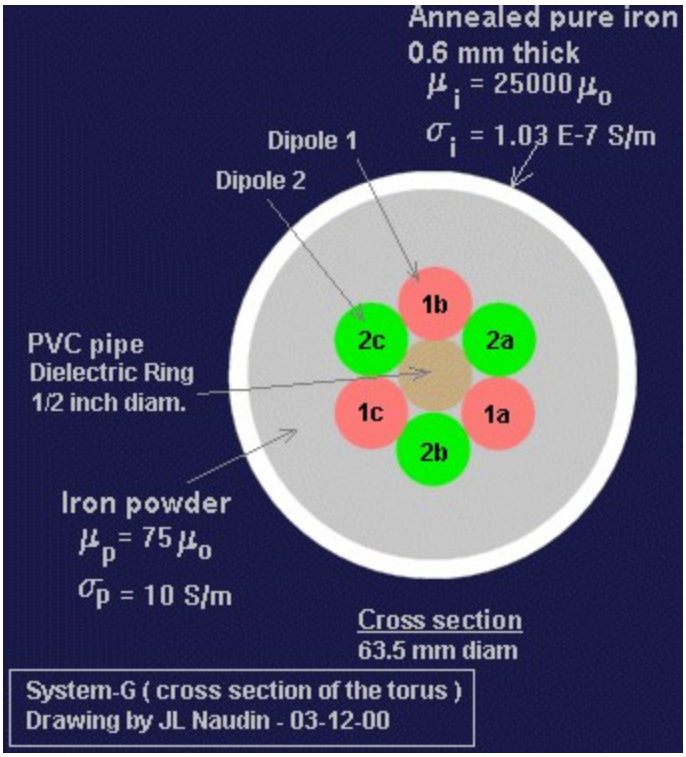
You may notice on the diagram above that only 1460 Watts are required to levitate 50 Kg at a frequency of 5 Hz...

== elfaiseir.gif



The plot above, shows the phase velocity reduced wavelength for an ELF antenna in seawater (published by the US Navy in 1960's), in air and also in a pure iron powder (for the System-G).

== sysgcross.gif



=== fdafrqexp.gif

The atoms absorb an ELF energy $U=\eta P_a/f$, where η is a particle-dependent absorption coefficient and P_a is the incident radiation power on the atom ; $P_a=DS_a$ where S_a is the atom's *geometric* cross section and $D=P/S$ the radiation power density on the atom. Thus ,

$$U=\eta\, DS_a/f \qquad (1)$$

By substituting this equation in Eq(1.05) , we will have

$$m_g = m_a - 2\left\{\sqrt{1+\left\{\frac{\eta DS_a}{m_a c^2}\sqrt{\frac{c^2\mu_{body}\sigma_{body}}{4\pi f^3}}\right\}^2} - 1\right\}m_a \qquad (2)$$

We then see that m_g DEPENDS ON f^3 .This is the GENERAL CASE.

However, IN PARTICULAR CASE where the radiation source is a short dipole encapsuled with a material (μ_p ,σ_p) it can be easily show that

$$U=\eta DS_a/f=\frac{2\eta S_a(I_0 z_0)^2}{3\sigma_p S\omega}\left(\tfrac{1}{2}\mu_p\sigma_p\omega\right)^{3/2} \qquad (3)$$

Thus, if the material which absorbs the ELFradiation has (μ_i ,σ_i).Then equation (1.05) gives,

$$m_g = m_a - 2\,\{[1+(2\eta\, S_a/3S\, m_a c)^2\,(\mu_i\,\sigma_i\,\sigma_p/2)(\mu_p/2)^3\,(z_0)^4\,I_0^4]^{1/2}-1\}m_a$$

which is independent of the frequency.

Fran De Aquino
April 13th, 2000

JL NAUDIN LABS
03/28/00

The System-G Equations Solver

v 1.05

by J-L Naudin

[ZIP]

Right Click / Save

Notes : You must have the JavaScript enabled in your Internet browser. This very helpful tool will allow you to find quickly the good setup for building your own System-G. You need only to enter the specifications of your components in the green areas and the solver will give you the calculated values in the red areas. The preset values are the parameters used by Fran De Aquino during his historical System-G experiment on January 27th, 2000, so you will able to check by yourself that the calculated values are close to the experimental values measured by Fran De Aquino.

When all your parameters are entered, you need only to press the "Calculate" button . To restart again the calculation, the "Restore" button will reset all the datas fields to their initial values.

Good Engineering,

Jean-Louis Naudin

Gravity Control by Means of Electromagnetic Field Through Gas or Plasma at Ultra-Low Pressure

by

Fran De Aquino

[PDF]

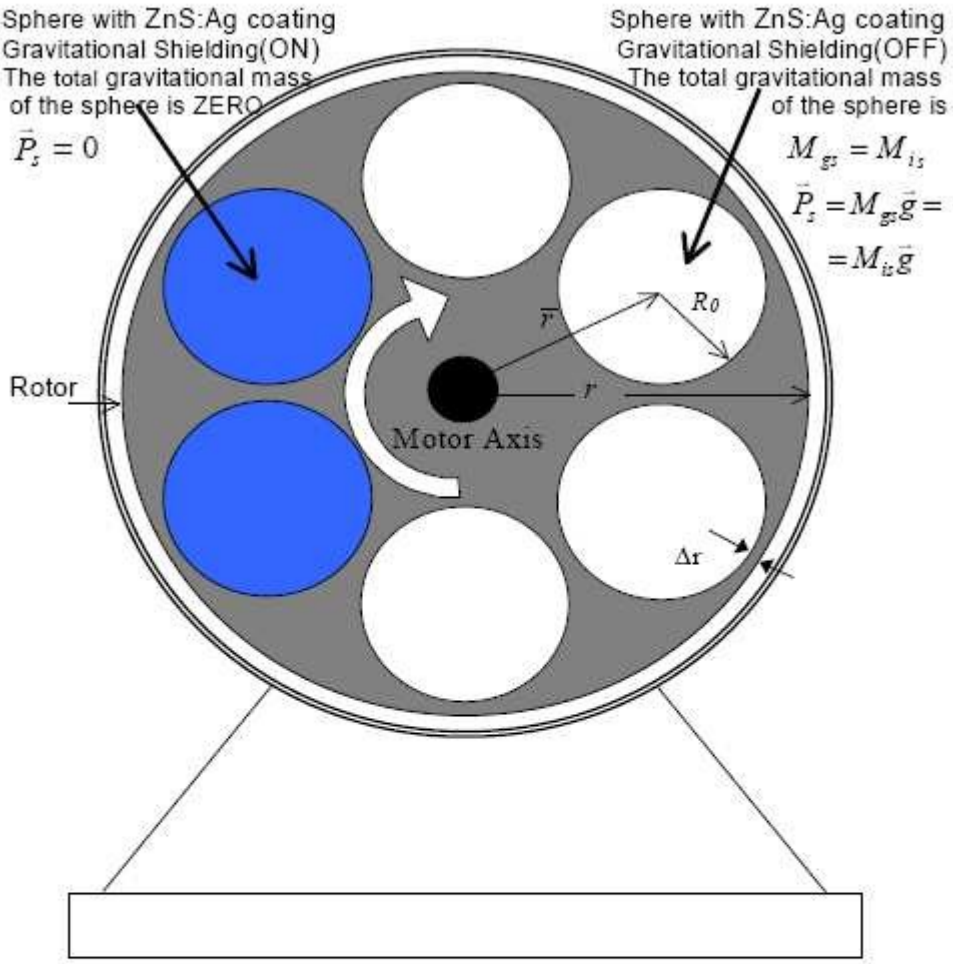
A Gravitational Shielding Based on ZnS:Ag Phosphor

by

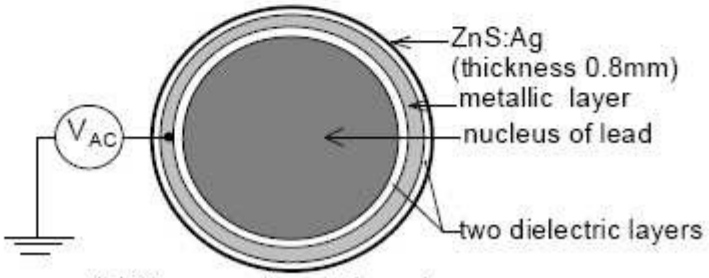
Fran De Aquino

[PDF]

It was shown that there is a practical possibility of gravity control on elelectroluminescent materials. We present here a type of G-SHielding based on an EL phosphor, namely zinc sulfide doped with silver (ZnS:Ag) which can reduce the cost of the G-Motor previously presented...



(a) Cross-section of the Motor



(b) Cross-section of the spheres

Fig.2 – The Gravitational Motor

How to Extract Energy Directly from a Gravitational Field

by

Fran De Aquino

[PDF]

Gravity is related to gravitational mass of the bodies. According to the weak form of Einstein's General Relativity equivalence principle, the gravitational and inertial masses are equivalent. However recent calculations (gr-qc/9910036) have revealed that they are correlated by an adimensional factor, which depends on the incident radiation upon the particle. It was shown that there is a direct correlation between the radiation absorbed by the particle and its gravitational mass, independently of the inertial mass. This finding has fundamental consequences to Unified Field Theory and Quantum Cosmology. It was also shown that only in the absence of electromagnetic radiation this factor becomes equal to one and that, in specific electromagnetic conditions, it can be reduced, nullified or made negative. This means that there is the possibility of control of the gravitational mass by means of the incident radiation. This unexpected theoretical result was recently confirmed by an experiment (gr-qc/0005107). Consequently there is a strong evidence that the gravitational forces can be reduced, nullified and inverted by means of electromagnetic radiation. This means that , in practice we can produce gravitational binaries, and in this way to extract energy from a gravitational field. Here we describe a process by which energy can be extracted directly from any site of a gravitational field.

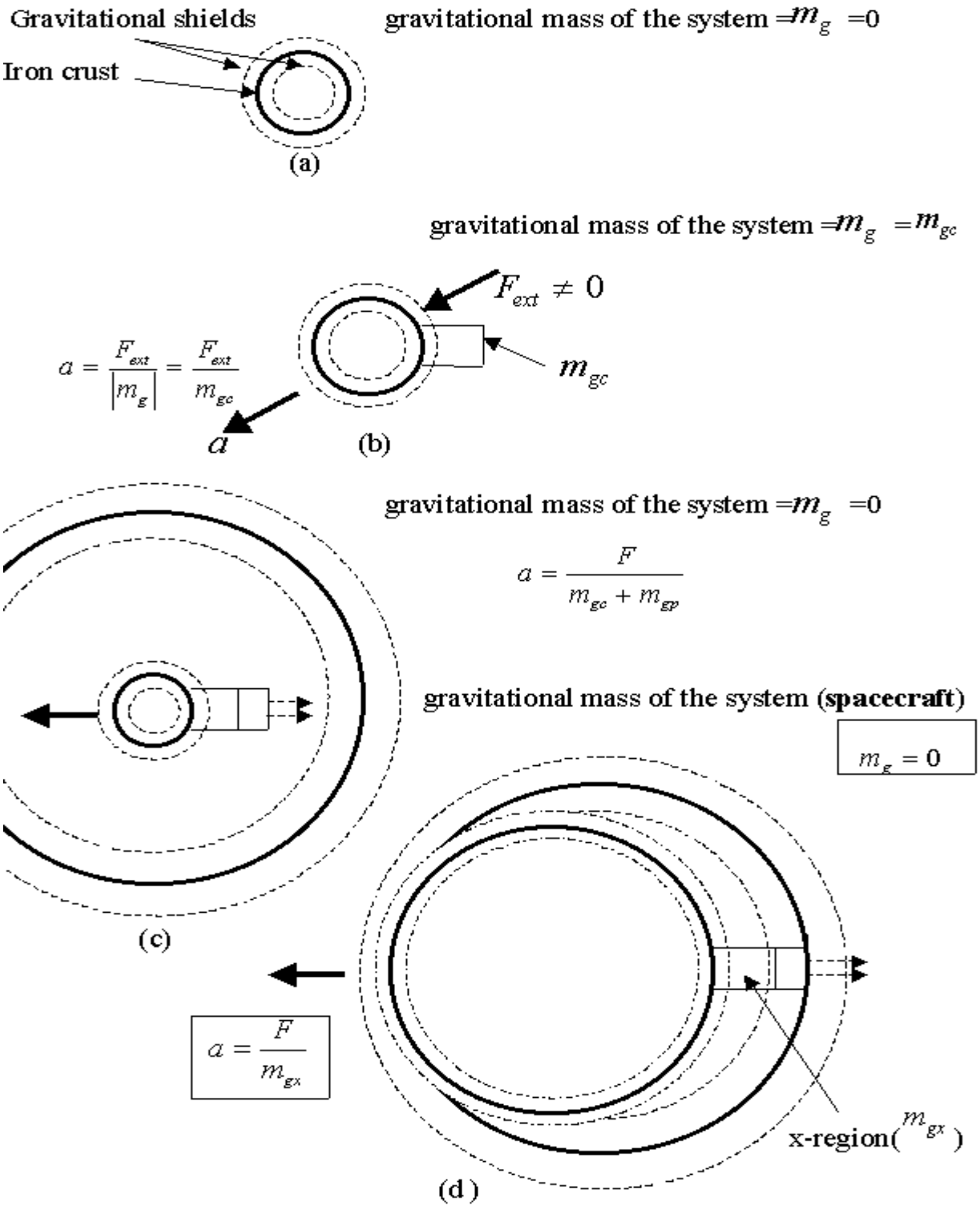


Fig. 1 - The Propulsion of the Spacecraft with Null Gravitational Mass.

http://www.frandeaquino.org/
http://users.elo.com.br/~deaquino/

Professor Fran De Aquino's Webpage

Physics Department, Maranhao State University
deaquino@uema.br

For several years, physicist Fran De Aquino worked as Senior-Researcher at the Instituto Nacional de Pesquisas Espaciais - INPE (National Institute for Space Research - INPE , Brazil) (INPE Registration Number 02844 CRN, SIAPE Registration Number 0024730). He was also Director of the INPE's Space Observatory in the city of São Luís, since the installation of this observatory until 1997.

Currently, physicist Fran De Aquino is a professor at the Universidade Estadual do Maranhão-UEMA (State University of Maranhao, Brazil), (UEMA Registration Number 5155). He also works as Consultant in Science & Technology for international companies. Fran De Aquino's publications list includes several scientific articles and books.

His research involves many relevant aspects of Gravitation and Cosmology. After thirty years of research, professor De Aquino discovered that the gravity can be quantized, starting from the generalization of the known action function. In discovering the quantization of gravity, Fran De Aquino made true an old dream of the Quantum Physicists - to obtain a Quantum Theory for Gravity.

This Quantum Theory of Gravity unifies Einstein's Theory of General Relativity with the Quantum Theory and, furthermore, it leads to an equation of correlation between gravitational mass and the inertial mass, which opens doors for gravity control technologies and the G ENERGY , the energy of the future that possibly it will change the paradigms of energy generation, transportation and telecommunications.

The theory shows that there is a revalidation of the strong equivalence principle, and consequently Einstein's equations are preserved. Thus, De Aquino's Quantum Theory of Gravity does not invalidate Einstein's Theory, on the contrary, it just complements this theory, in such a way as Einstein's theory has complemented Newton's theory.

The Einstein's equations are deduced directly from De Aquino's theory. Moreover, a generalized equation for inertial forces is obtained , which incorporates the Mach's principle into Gravitation, explainning therefore the origin of inertia, and yielding a new expression for gravitational forces which includes the Newton's attraction law, and shows that the graviton must have spin 1 and not 2. The theory also allows the deduction of the Entropy's differential equation; the Hamiltonian for a particle in an electromagnetic field and the reciprocal fine structure constant. It is also possible to explain the Inflation Period and the Hidden Matter, without assuming the existence of vacuum fluctuations. Similarly, it is possible to obtain the Casimir force, whithout assuming the existence of zero-point field. Another fundamental consequence of De Aquino's theory is the

possibility of control of the gravitational mass. In addition, De Aquino's Quantum Theory of Gravity shows that, in specific ultra-high energy conditions, the gravitational and electromagnetic fields can be described by the same Hamiltonian, i.e., in these circumstances, they are unified. Such conditions might have occurred inclusively in the Initial Universe, before the first spontaneous breaking of Symmetry. Therefore, this Kinetic approach to Quantum Gravity will allow us to understand some crucial matters in Quantum Cosmology, including the early stages of the Big Bang. For some physicists, this theory might be it the Holy Graal of Modern Physics because it can complete the unification of all fundamental laws of Physics. Now, it is possible for the first time to write down a single equation (Eq.1 of Mathematical Foundations of the Relativistic Theory of Quantum Gravity. See T-shirt below) that can explain all the laws of physics(including the Einstein's equations), all the forces of nature - the proverbial "theory of everything". This grand unified theory comprhends Philosophy, God (including feminine aspects), and the Soul. It is not restricted only to the material world it includes not only force particles and matter particles, not only general relativity and Quantum Gravity, but also a theory of consciousness.

---

http://users.elo.com.br/~deaquino/Kinetic.pdf
http://arxiv.org/abs/physics/0212033
http://cdsweb.cern.ch/ (Record # 595902)
http://issuu.com/aquino/docs/kinetics
http://www.scribd.com/doc/21561154/Mathematical-Foundations-of-the-Relativistic-Theory-of-Quantum-Gravity
http://sciencestage.com/d/5856128/mathematical-foundations-of-the-relativistic-theory-of-quantum-gravity.html

Mathematical Foundations of the Relativistic Theory of Quantum Gravity

by

Fran De Aquino

[PDF]

Abstract: Starting from the action function, we have derived a theoretical background that leads to the quantization of gravity and the deduction of a correlation between the gravitational and inertial masses, which depends on the kinetic momentum of the particle. We show that there is a reaffirmation of the strong equivalence principle and, consequently, Einstein's equations are preserved. In fact, such equations are deduced here directly from this approach to Gravity. Moreover, we have obtained a generalized equation for inertial forces, which incorporates the Mach's principle into Gravitation. Also, we have deduced the equation of Entropy; the Hamiltonian for a particle in an electromagnetic field and the reciprocal fine structure constant. It is possible to deduce the expression of the Casimir force and also to explain the Inflation Period and the Missing Matter, without assuming the existence of vacuum fluctuations. This new approach to Gravity will allow us to understand some crucial matters in Cosmology.

The Journal of New Energy
(Salt Lake City, Utah, USA, ISSN: 1086-8259)

Gravity Control by Means of Electromagnetic Field through Gas or Plasma at Ultra-Low Pressure

by

Fran De Aquino

Abstract : It is shown that the gravity acceleration just above a chamber filled with gas or plasma at ultra-low pressure can be strongly reduced by applying an Extra Low-Frequency (ELF) electromagnetic field across the gas or the plasma. This Gravitational Shielding Effect is related to recent discovery of quantum correlation between gravitational mass and inertial mass. According to the theory samples hung above the gas or the plasma should exhibit a weight decrease when the frequency of the electromagnetic field is decreased or when the intensity of the electromagnetic field is increased. This Gravitational Shielding Effect is unprecedented in the literature and can not be understood in the framework of the General Relativity. From the technical point of view, there are several applications for this discovery; possibly it will change the paradigms of energy generation, transportation and telecommunications.

Contents

1. Gravity Control Cell (GCC)

2. Gravitational Motor

3. Gravitational Spacecraft

4. Decreasing of inertial forces on the Gravitational Spacecraft.

5.Gravity Control inside the Gravitational Spacecraft.

6. Gravitational Thrusters.

7. Artificial Atmosphere surround the Gravitational Spacecraft.

8. Gravitational Lifter.

9. High Power Electromagnetic Bomb (A new type of E-bomb).

10. Gravitational Press of Ultra-High Pressure.

11. Generation and Detectation of Gravitational Radiation.

12. Quantum Gravitational Antennas. Quantum Transceivers.

13. Instantaneous Interstellar Communications

14.Wireless Electric Power Transmission using Quantum Gravitational Antennas.

15. Method and Device using GCCs for obtaining images of Imaginary Bodies.

The Gravity Control Cell

A device called, the Gravity Control Cell, which has the property of reducing, to annul, to invert and to intensify the intensity of the local gravity, has been developed starting from the discovery of the quantum correlation between the gravitational mass and inertial mass published in the article " Mathematical Foundations of the Relativistic Theory of Quantum Gravity ", Copyright © 2002-2008 by Fran De Aquino, available at: arXiv - physics/0212033. In this article, it was shown that any body submitted to the action of an electromagnetic field has its gravitational mass reduced and that the gravity acceleration in any traverse direction to the body is reduced at the same proportion in which the gravitational mass of the body it was reduced. According to this principle, here called of General Principle of Gravity Control, the change in the gravitational mass of the body, and in the gravity acceleration in any transverse direction to the body, is directly proportional to the product of the refraction index by the density of electromagnetic energy applied upon the body, and inversely proportional to the mass density of the body (q.v. "Mathematical Foundations of the Relativistic Theory of Quantum Gravity"). The use of gas or plasma at ultra-low pressure in the Gravity Control Cells elapses from the fact that the gases or plasmas have low mass density and, as smaller the smaller pressure also the mass density of the gas or plasma. The Gravity Control Cell is a device absolutely unprecedented in the literature. From the technological viewpoint, there are several applications for this invention; possibly it will change the paradigms of the energy generation (G ENERGY), transportation and telecommunications. As shown in the article "Gravity Control by means of Electromagnetic Field through Gas or Plasma at Ultra-Low Pressure", Copyright © 2007 by Fran De Aquino, available at: arXiv - physics/0701091, the Gravity Control Cells can be used to convert gravitational(G) energy into rotational mechanical energy. Thus, starting from this Gravitational Motor it is possible to get electric energy by means of a conventional electric generator coupled to the Gravitational Motor. The Gravity Control Cells can also be used to yield thrust. In this case the thruster system, called of Gravitational Thruster can produce several Kilonewtons. These Gravitational Thrusters can be used as basic elements of propulsion in the most of transport systems, and certainly they will have applications in the most several industrial processes; this technology probably will find several applications in other areas of the human activity. They can still be used in the construction of a Gravitational Press of Ultra-high Pressure, as detailed in the article "Gravity Control by means of Electromagnetic Field through Gas or Plasma at Ultra-Low Pressure ". In aerospace spacecrafts (Gravitational Spacecrafts) they will have a lot of applications, for example, to produce artificial gravity inside the spacecraft. As a consequence of General Principle of Gravity Control, and of the advent of the "Gravity Control Cells" arises then a new concept of spacecraft and aerospace flight, it also appears a new benefit for the area of the telecommunications with the possibility of building transmitters and receivers whose operation are based on the method of gravity control here described. These systems can be also projected for wireless electric power transmission. (q.v. "Gravity Control by means of Electromagnetic Field through Gas or Plasma at Ultra-Low Pressure")...

---

http://www.electrogravity.com/Uncertainty.htm

A New Approach To The System-G Test by Fran De Aquino Generalizes All Electrogravitational Force Tests

by

Jerry E. Bayles

quark137@aol.com
jebayles2001@yahoo.com
Electrogravitational Research Project

November 09, 2001

UNCERTAINTY RULES!

Recently I have analyzed the torus test done by Fran De Aquino that showed a significant weight loss according to his published results. My recent analysis of his test involves the quantum aspect of uncertainty rather than the extreme low frequency electromagnetic absorption of energy by iron atoms as proposed in his paper, "Gravitation and Electromagnetism; Correlation and Grand Unification," gr-qc/9910036.

It is an established fact that macroscopic systems cannot be expected to exhibit quantum effects since the uncertainty associated with a large mass is very small as is shown by the following equation:

$$m = \frac{h}{2\pi \, dv \, dr}$$ (Assume the mass to be several kilograms.)

h = Planks constant, dv is the uncertainty in the velocity and dr is the uncertainty in radius all in S. I. units.

Therefore, it is very unlikely that your car will 'leak' out of the garage due to a quantum action unexpectedly! However, on the quantum scale of a single atom, uncertainty really does rule since absorption and emission occur via quantum 'bits' of energy. Albert Einstein established this fact (circa 1905) when he described this action to explain the photoelectric effect: it was not the amount of radiation that caused electron emission from a metal but the frequency. The higher the frequency, the more energy the electron absorbed and the faster it was ejected from the metal. Thus was established the famous equation E = hf where E is the energy related to the absorption or emission while (f) is the related frequency and (h) is Plank's constant.

My Analysis:

I propose that what is occurring in Fran's torus test is a large increase in the spin and magnetic moment uncertainty of the iron atoms. Thus, a phase change occurs related directly to the spin uncertainty of the electrons in the iron atoms. This phase change works to reduce the

electrogravitational action force...

3. Quantization of Velocity (c the Universal Reference Speed)

4. Quantization of Time (quantized spacetime—space and time being granular, not continuous, at its smallest scales)

5. Correlation Between Gravitational and Inertial Masses

6. Generalization of Lorentz's Force

7. Gravittoelectromagnetic fields and Gravitational shielding

8. Gravitational Effects produced by ELF radiation upon the electric current

9. Magnetic Fields affect gravitational mass and the momentum

10. Gravitational Motor

11. Gravitational Mass and Earthquakes

12.The Strong Equivalence Principle

13. Incorporation of the Mach's Principle into Gravitation Theory

14. Deduction of the Equations of General Relativity

15. Gravitons: Gravitational Forces are also Gauge forces

16. Deduction of Entropy Equation starting from the Gravity Theory

17. Unification of the Electromagnetic and Gravitational Fields

18. Elementary Quantum of Matter

19. The Casimir Force is a gravitational effect related to the Uncertainty Principle

20. The Shape of the Universe and Maximum speed of Tachyons

21. The Hidden Mass and explanation for red-shift anomalies

22. The Expanding Universe is accelerating and not decelerating

23. Gravitational and Inertial Masses of the Photon

24. What causes the fundamental particles to have masses?

25. Electron's imaginary masses

26. Transitions to the Imaginary space-time

27. Superparticles (hypermassive Higgs bosons) and Big-Bang

28. Deduction of Reciprocal Fine Structure Constant and the Uncertainty Principle

29. The Inflation Period

30. The Origin of the Universe

31. A Solution for the Black Hole Information Paradox.

32. A Creator's need

33. The Origin of Gravity and Genesis of the Gravitational Energy

34. Explanation for the anomalous acceleration of Pioneer 10

35. New type of interaction

36. Allais effect explained

Transformer Supplemental Information

by

John Xydous

[PDF]

" ... we can use almost any welding transformer to drive the antenna ... "

Thomas Townsend BROWN Gravitator

"How I Control Gravitation"
British Patent # 300,311

"How I Control Gravitation"

by
T.T. Brown

Science & Invention (August 1929) / *Psychic Observer* 37(1)

There is a decided tendency in the physical sciences to unify the great basic laws and to relate, by a single structure or mechanism, such individual phenomena as gravitation, electrodynamics and even matter itself. It is found that matter and electricity are very closely related in structure. In the final analysis matter loses its traditional individuality and becomes merely an "electrical condition." In fact, it might be said that the concrete body of the universe is nothing more than an assemblage of energy which, in itself, is quite intangible. Of course, it is self-evident that matter is connected with gravitation and it follows logically that electricity is likewise connected. These relations exist in the realm of pure energy and consequently are very basic in nature. In all reality *they constitute the true backbone of the universe*. It is needless to say that the relations are not simple, and full understanding of their concepts is complicated by the outstanding lack of information and research on the real nature of gravitation.

The theory of relativity introduced a new and revolutionary light to the subject by injecting a new conception of space and time. Gravitation thus becomes the natural outcome of so-called "distorted space." It loses its Newtonian interpretation as a tangible mechanical force and gains the rank of an "apparent" force, due merely to the condition of space itself.

Fields in space are produced by the presence of material bodies or electric charges. They are gravitational fields or electric fields according to their causes. Apparently they have no connection one with the other. This fact is substantiated by observations to the effect that electric fields can be shielded and annulled while gravitational fields are nearly perfectly penetrating. This dissimilarity has been the chief hardship to those who would compose a Theory of Combination.

It required Dr. Einstein's own close study for a period of several years to achieve the results others have sought in vain and to announce with certainty the unitary field laws.

Einstein's field theory is purely mathematical. It is not based on the results of any laboratory test and does not, so far as known, predict any method by which an actual demonstration or proof may be made. The new theory accomplishes its purpose by "rounding out" the accepted Principles of Relativity so as to embrace electrical phenomena.

The Theory of Relativity thus supplemented represents the last word in mathematical physics. It is most certainly a theoretical structure of overpowering magnitude and importance. The thought involved is so far reaching that it may be many years before the work is fully appreciated and understood.

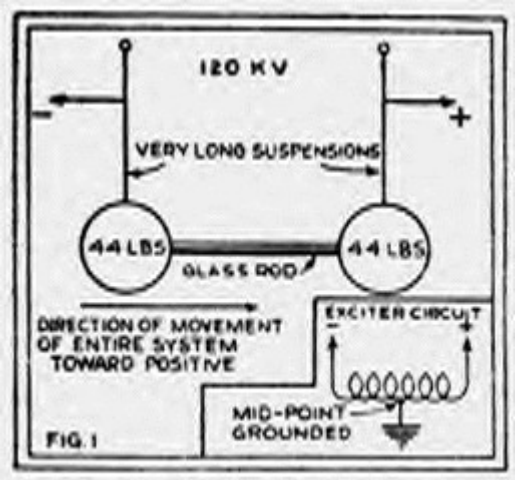
Early Investigations ~

The writer and his colleagues anticipated the present situation even as early as 1923, and began at that time to construct the necessary theoretical bridge between the two then separate phenomena, electricity and gravitation. The first actual demonstration of the relation was made in 1924. Observations were made of the individual and combined motions of two heavy lead balls which were suspended by wires 45 cm. apart. The balls were given opposite electrical charges and the charges were maintained. Sensitive optical methods were employed in measuring the movements, and as near as could be observed the balls appeared to behave according to the following law: "Any system of two bodies possesses a mutual and unidirectional force (typically in the line of the bodies) which is directly proportional to the product of the masses, directly proportional to the potential difference and inversely proportional to the square of the distance between them."

The peculiar result is that the gravitational field of the Earth had no apparent connection with the experiment. The gravitational factors entered through the consideration of the mass of the electrified bodies.

The newly discovered force was quite obviously the resultant physical effect of an electro-gravitational interaction. It represented the first actual evidence of the very basic relationship. The force was named "gravitator action" for want of a better term and the apparatus or system of masses employed was called a "gravitator."

Figure 1 ~



A SIMPLE TYPE OF GRAVITATOR IS SHOWN IN THE ABOVE ILLUSTRATION.

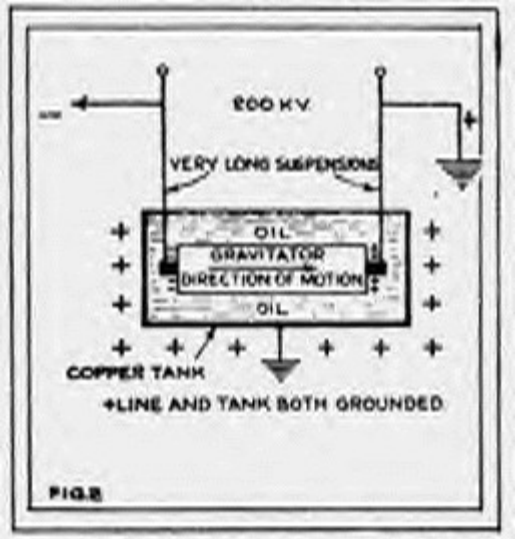
Since the time of the first test the apparatus and the methods used have been greatly improved and simplified. Cellular "gravitators" have taken the place of the large balls of lead. Rotating frames supporting two and four gravitators have made possible acceleration measurements. Molecular gravitators made of solid blocks of massive dielectric have given still greater efficiency. Rotors and pendulums operating under oil have eliminated atmospheric considerations as to pressure, temperature and humidity. The disturbing effects of ionization, electron emission and pure electro-statics have likewise been carefully analyzed and eliminated. Finally after many years of tedious work and with refinement of methods we succeeded in observing the gravitational variations produced by the moon and sun and much smaller variations produced by the different planets. It is a curious fact that the effects are most pronounced when the affecting body is in the alignment of the differently charged elements and least pronounced when it is at right angles.

Much of the credit for this research is due to Dr. Paul Biefield, Director of Swazey Observatory. The writer is deeply indebted to him for his assistance and for his many valuable and timely suggestions.

Gravitator Action an Impulse ~

Let us take, for example, the case of a gravitator totally immersed in oil but suspended so as to act as a pendulum and swing along the line of its elements.

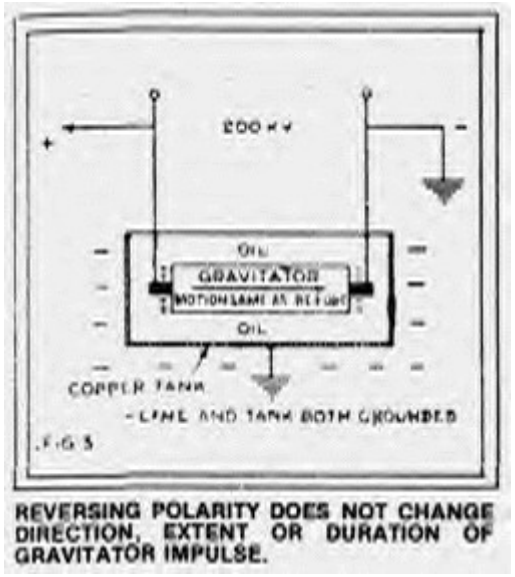
Figure 2 ~



THE PRINCIPLE OF THE ELECTRO-GRAVITIC PENDULUM IS SHOWN HERE. GRAVITATOR MOVES IN A DIRECTION OPPOSITE TO THAT REQUIRED BY THE LAWS OF ELECTROSTATIC ATTRACTION AND REPULSION.

When the direct current with high voltage (75-300 kilovolts) is applied the gravitator swings up the arc until its propulsive force balances the force of the earth's gravity resolved to that point, then it stops, but it does not remain there. The pendulum then gradually returns to the vertical or starting position even while the potential is maintained. The pendulum swings only to one side of the vertical. Less than five seconds is required for the test pendulum to reach the maximum amplitude of the swing but from thirty to eighty seconds are required for it to return to zero.

Figure 3 ~

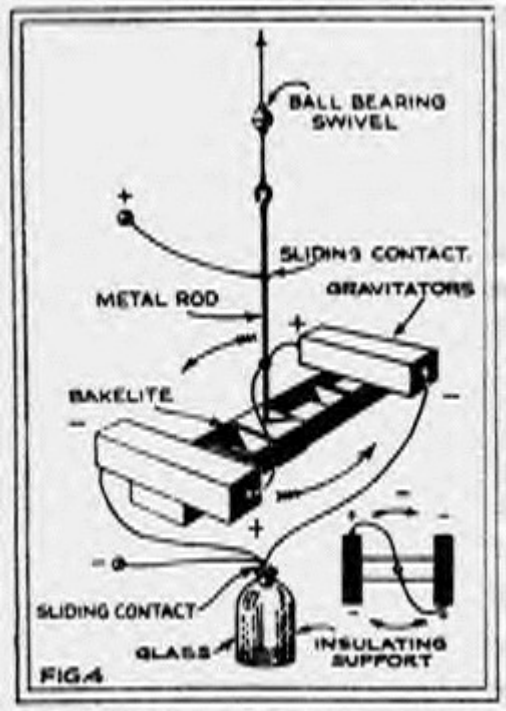


REVERSING POLARITY DOES NOT CHANGE DIRECTION, EXTENT OR DURATION OF GRAVITATOR IMPULSE.

The total time or duration of the impulse varies with such cosmic conditions as the relative position and distance of the moon, sun and so forth. It is in no way affected by fluctuations in the supplied voltage and averages the same for every mass or material under test. The duration of the

impulse is governed solely by the condition of the gravitational field. It is a value which is unaffected by changes in the experimental set-up, voltage applied or type of gravitator employed. Any number of different kinds of gravitators operating simultaneously on widely different voltages would reveal exactly the same impulse duration at any instant. Over an extended period of time all gravitators would show equal variations in the duration of the impulse.

Figure 4 ~



A GRAVITATOR ROTOR IS SIMPLY AN ASSEMBLY OF UNITS SO MADE THAT ROTATION RESULTS UNTIL THE IMPULSE IS EXHAUSTED.

After the gravitator is once fully discharged, its impulse exhausted, the electrical potential must be removed for at least five minutes in order that it may recharge itself and regain its normal gravitic condition. The effect is much like that of discharging and charging a storage battery, except that electricity is handled in a reverse manner. When the duration of the impulse is great the time required for complete recharge is likewise great. The times of discharge and recharge are always proportional. Technically speaking, the exo-gravitic rate and the endo-gravitic rate are proportional to the gravitic capacity.

Summing up the observations of the electro-gravitic pendulum the following characteristics are noted:

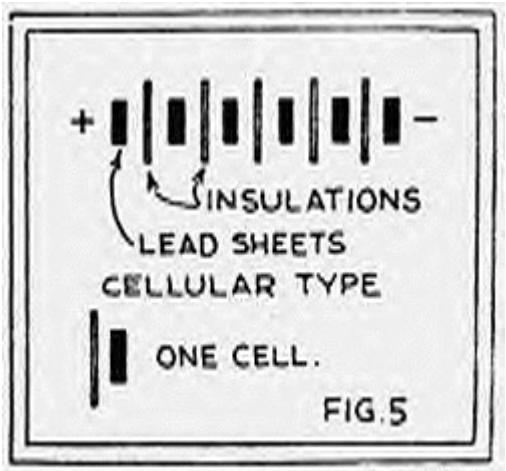
APPLIED VOLTAGE determines only the amplitude of the swing.

APPLIED AMPERAGE is only sufficient to overcome leakage and maintain the required voltage through the losses of the dielectric. Thus the total load approximates on 37 ten-millionths of an ampere. It apparently has no other relation to the movement at least from the present state of physics.

MASS of the dielectric is a factor in determining the total energy involved in the impulse. For a given amplitude an increase in mass is productive of an increase in the energy exhibited by the system (E = mg).

DURATION OF THE IMPULSE with electrical conditions maintained is independent of all of the foregoing factors. It is governed solely by external gravitational conditions, positions of the moon, sun, etc., and represents the total energy or summation of energy values which are effective at that instant.

Figure 5 ~

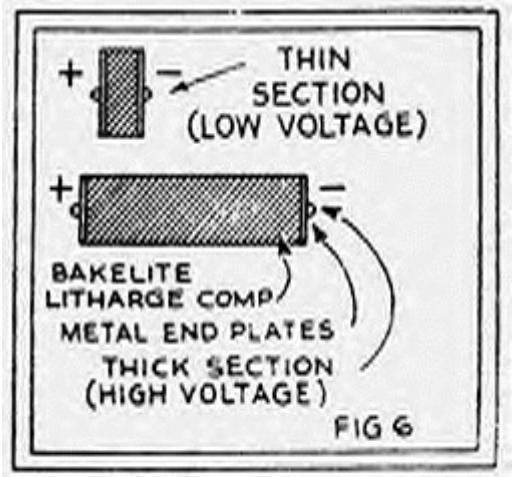


THE CELLULAR GRAVITATOR IS BUILT IN THE FORM OF A HIGH VOLTAGE SERIES CONDENSOR.

GRAVITATIONAL ENERGY LEVELS are observable as the pendulum returns from the maximum deflection to the zero point or vertical position. The pendulum hesitates in its return movement on definite levels or steps. The relative position and influence of these steps vary continuously every minute of the day. One step or energy value corresponds in effect to each cosmic body that is influencing the electrified mass or gravitator. By merely tracing a succession of values over a period of time a fairly intelligible record of the paths and the relative gravitational effects of the moon, sun, etc., may be obtained.

In general then, every material body possesses inherently within its substance separate and distinct energy levels corresponding to the gravitational influences of every other body. these levels are readily revealed as the electro-gravitic impulse dies and as the total gravitic content of the body is slowly released.

Figure 6 ~



THE MOLECULAR TYPE GRAVITATOR IS MADE WITH A DIELECTRIC BLOCK AND METAL END PLATES OR ELECTRODES.

The gravitator, in all reality, is a very efficient electric motor. Unlike other forms of motors it does not in any way involve the principles of electromagnetism, but instead it utilizes the newer principles of electro-gravitation. A simple gravitator has no moving parts but is apparently capable of moving itself from within itself. it is highly efficient for the reason that it uses no gears, shafts, propellers or wheels in creating its motive power. It has no internal resistance and no observable rise in temperature. Contrary to the common belief that gravitational motors must necessarily be vertical-acting the gravitator, it is found, acts equally well in every conceivable direction.

While the gravitator is at present primarily a scientific instrument, perhaps even an astronomical instrument, it also is rapidly advancing to a position of commercial value. Multi-impulse gravitators weighing hundreds of tons may propel the ocean liners of the future. Smaller and more concentrated units may propel automobiles and even airplanes. Perhaps even the fantastic "space cars" and the promised visit to Mars may be the final outcome. Who can tell?

British Patent # 300,311 (Nov. 15, 1928)

A Method of & an Apparatus or Machine for Producing Force or Motion

I, Thomas Townsend Brown, a citizen of the USA, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement: ---

This invention relates to a method of controlling gravitation and for deriving power therefrom, and to a method of producing linear force or motion. The method is fundamentally electrical.

The invention also relates to machines or apparatus requiring electrical energy that control or influence the gravitational field or the energy of gravitation; also to machines or apparatus requiring electrical energy that exhibit a linear force or motion which is believed to be independent of all frames of reference save that which is at rest relative to the universe taken as a whole, and said linear force or motion is furthermore believed to have no equal and opposite reaction that can be observed by any method commonly known and accepted by the physical science to date.

The invention further relates to machines or apparatus that depend for their force action or motive power on the gravitational field or energy of gravitation that is being controlled or influenced as above stated; also, to machines or apparatus that depend for their force action or motive power on the linear force action or motive power on the linear force or motion exhibited by such machines or apparatus previously mentioned.

The invention further relates to machines and apparatus that derive usable energy or power from the gravitational field or from the energy of gravitation by suitable arrangement, using such machines and apparatus as first above stated as principal agents.

To show the universal adaptability of my novel invention, said method is capable of practical performance and use in connection with motors for automobiles, space cars, ships, railway locomotion, prime movers for power installations, aeronautics. Still another field is the use of the method and means enabling the same to function as a gravitator weight changer. Specific embodiments of the invention will be duly disclosed through the medium of the present Specification.

Referring to the accompanying drawings, forming part of this Specification:

Figure 1 is an elevation, with accompanying descriptive data, broadly illustrating the characteristic or essential elements associated with any machine or apparatus in the use of which the gravitational field or the energy of gravitation is utilized and controlled, or in the use of which linear force or motion may be produced.

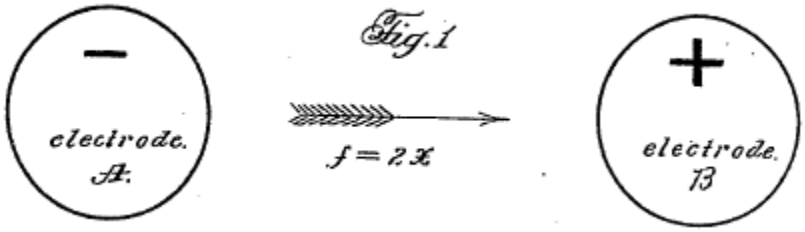


Figure 2 is a similar view of negative and positive electrodes with an interposed insulating member, constituting an embodiment of the invention.

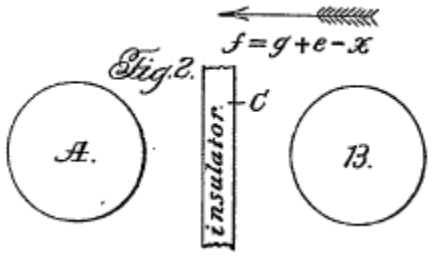


Figure 3 is a similar view of a cellular gravitator composed of a plurality of cell units connected in series, capable of use in carrying the invention into practice.

Figure 4 is an elevation of positive and negative electrodes diagrammatically depicted to indicate their relation and use when conveniently placed and disposed within a vacuum tube.

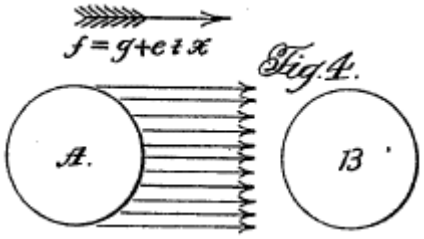


Figure 5 and 5' are longitudinal sectional views showing my gravitator units embodies in vacuum tube form wherein heating to incandescence is permitted as by electrical resistance or induction at the negative electrode; and also permitting, where desired, the conducting of excessive heat away from the anode or positive electrode by means of air or water cooling devices.

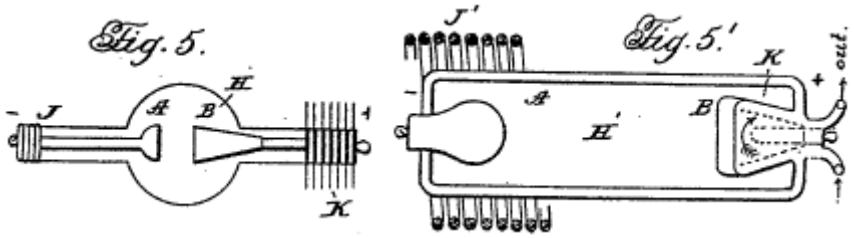


Figure 6 is an elevation or an embodiment of my invention in a rotary or wheel type of motor utilizing the cellular gravitators illustrated in Figure 3.

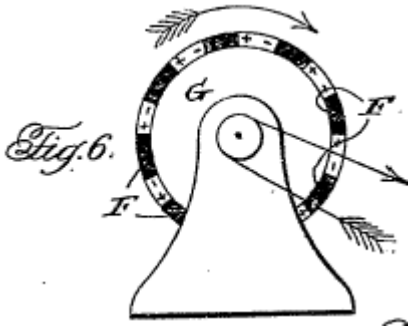


Figure 7 is a view similar to Figure 6 of another wheel form or rotary type of motor involving the use of the gravitator units illustrated in Figure 5, or Figure 5'.

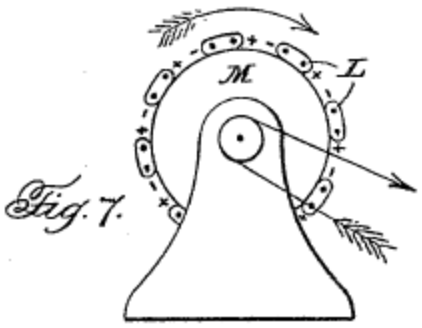


Fig. 7.

Figure 8 is a perspective view partly in section of the cellular gravitator of Figure 3 illustrating the details thereof.

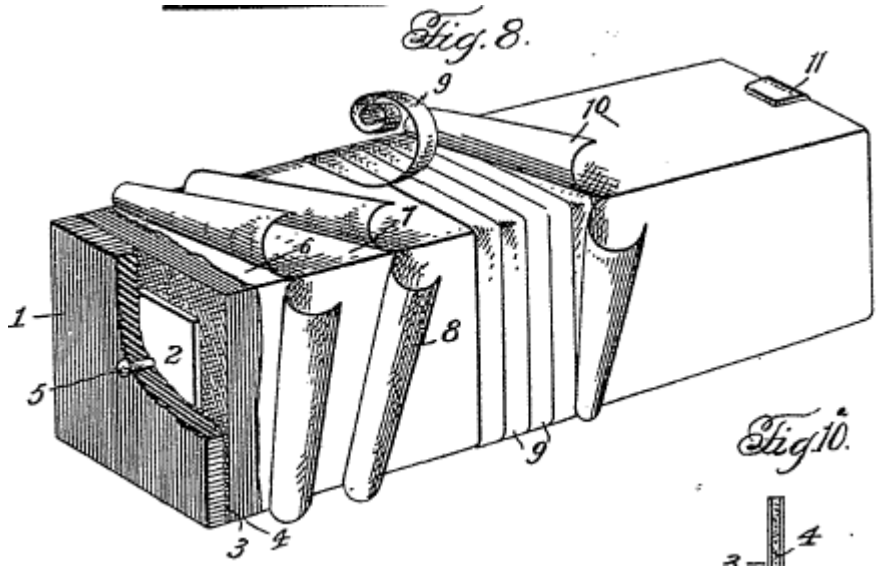


Fig. 8.

Fig. 10.

Figures 9, 10 and 10a are detail views of the cellular gravitator.

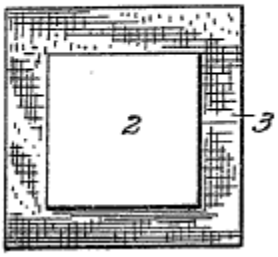


Fig. 9.

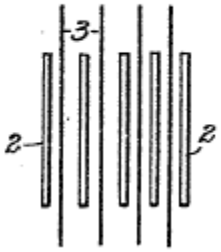


Fig. 10.

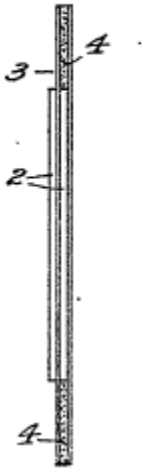
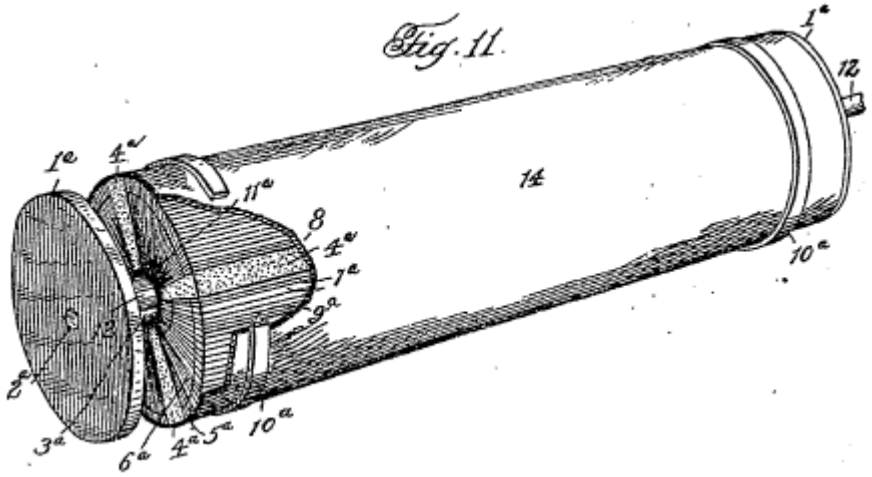
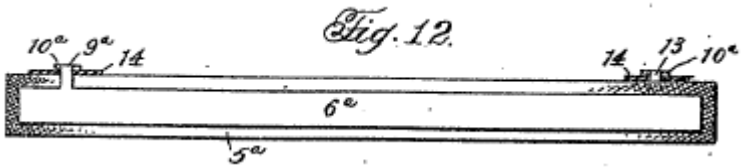


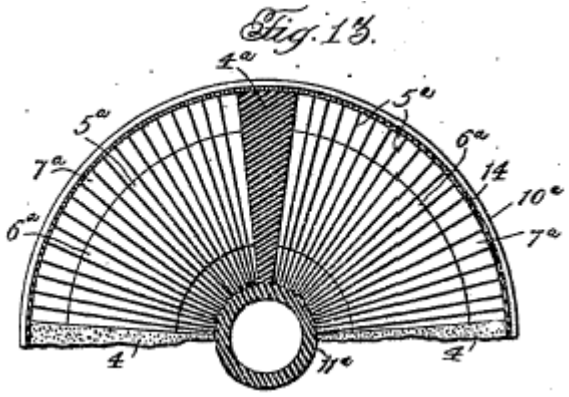
Fig. 10.

Figure 11 is a view similar to Figure 3 with the same idea incorporated in a rotary motor.



Figures 12 and 13 are detail views thereof.





The general showing in Figure 1 will make clear how my method for controlling or influencing the gravitational field or the energy of gravitation, or for producing linear force or motion, is utilized by any machine or apparatus having the characteristics now to be pointed out.

Such a machine has two major parts A and B. These parts may be composed of any material capable of being charged electrically. Mass A and mass B may be termed electrodes A and B respectively. Electrode A is charged negatively with respect to electrode B, or what is substantially the same, electrode B is charged positively with respect to electrode A, or what is usually the case, electrode A has an excess of electrons while electrode B has an excess of protons.

While charged in this manner the total force of A toward B is the sum of force *g* (due to the normal gravitational field) and force *c* (due to the imposed electrical field) and force *x* (due to the

resultant of unbalanced gravitational forces caused by the electronegative charge or by the presence of an excess of electrons on electrode A and by the electro-positive charge or the presence of an excess of protons on electrode B.

By the cancellation of similar and opposing forces and by the addition of similar and allied forces the two electrodes taken collectively possess a force $2x$ in the direction of B. This force $2x$ shared by both electrodes exists as a tendency of these electrodes to move or accelerate in the direction of the force, that is, A toward B and B away from A. Moreover any machine or apparatus possessing electrodes A and B will exhibit such a lateral acceleration or motion of free to move. Such a motion is believed to be due to the direct control and influence of the energy of gravitation by the electrical energy which exists in the unlike electrical charges present on the affected electrodes. This motion seems to possess no equal or opposite motion that is detectable by the present day mechanics.

It is to be understood that in explaining the theory underlying my invention I am imparting by best understanding of that theory, derived from practical demonstration by the use of appropriate apparatus made in keeping with the teachings of the present Specification. The practice of the method, and apparatus aiding in the performance of the method, have been successful as herein disclosed, and the breadth of my invention and discovery is such as to embrace any corrected or more refined theory that may be found to underlie the phenomena which I believe myself to be the first to discover and put to practical service.

In this Specification I have used terms as "gravitator cells" and "gravitator cellular body" which are words of my own coining in making reference to the particular type of cell I employ in the present invention. Wherever the construction involves a pair of electrodes, separated by an insulating plate or member, such construction complies with the term gravitator cells, and when two or more gravitator cells are connected in series within a body, such will fall within the meaning of gravitator cellular body.

In Figure 2 the electrodes A and B are shown as having placed between them an insulating plate or member C of suitable material, such that the minimum number of electrons or ions may successfully penetrate it. This constitutes a cellular gravitator consisting of one gravitator cell.

A cellular gravitator, consisting of more than one cell, will have the cell units connected in series. This type is illustrated in Figure 3, D being insulating members and E suitable conducting plates. It will be readily appreciated that many different arrangements for cell units, each possessing distinct advantages, may be resorted to.

One arrangement, such as just referred to, is illustrated in Figure 6of the drawings. Here the cells designated F are grouped in spaced relation and placed evenly around the circumference of a wheel G. Each group of cells F possesses a linear acceleration and the wheel rotates as a result of the combined forces. It will be understood that, the cells being spaced substantial distances apart, the separation of adjacent positive and negative elements of separate cells is greater than the separation of the positive and negative elements of any cell, and the materials of which the cells are formed being the more readily affected by the phenomena underlying my invention than the mere space between adjacent cells, any forces existing between positive and negative elements of adjacent cells can never become of sufficient magnitude to neutralize or balance the force created by the respective cells adjoining said spaces. The uses to which such a motor, wheel or rotor may be put are practically limitless, as can be readily understood without further description. The structure may suitably be called a gravitator motor of cellular type.

In keeping with the purpose of my invention, an apparatus may employ the electrodes A and B within a vacuum tube. This aspect of the invention is shown in Figures 4 and 5. In Figure 4 the

electrodes are such as are adapted to be placed within a vacuum tube H (Figure 5), the frame and mounting being well within the province of the skilled artisan. Electrons, ions, or thermions can migrate readily from A to B. The construction may be appropriately termed an electronic, ionic, or thermionic gravitator as the case may be.

In certain of the last named types of gravitator units, it is desirable or necessary to heat to incandescence the whole or part of electrode A to obtain better emission of negative thermions or electrons or at least to be able to control that emission by variation in the temperature of said electrode A. Since such variations also influence the magnitude of the longitudinal force or acceleration exhibited by the tube, it proves to be a very convenient method of varying the motion of the tube. The electrode A may be heated to incandescence in any convenient way as by the ordinary methods utilizing electrical resistance or electrical induction, an instance of the former being shown at J (Figure 5), and an instance of the latter at J' (Figure 5'), the vacuum tube in Figure 5' being designated H'.

Moreover, in certain types of the gravitator units, now being considered, it is advantageous or necessary also to conduct away from the anode of positive electrode B excessive heat that may be generated during the operation of tube H or H'. Such cooling is effected externally by means of air or water-cooled flanges that are in thermo connection with the anode, or it is effected internally by passing a stream of water, air or other fluid through a hollow anode made especially for that purpose. Air cooled flanges are illustrated at K (Figure 5) and a hollow anode for the reception of a cooling liquid or fluid (as air or water) as shown at K' (Figure 5'). These electronic, ionic or thermionic gravitator units may be grouped in any form productive of a desired force action or motion. One such form is the arrangement illustrated in Figure 7 where the particular gravitator units in question are indicated at L, disposed around a wheel or rotary motor similarly to the arrangement of the gravitator motor of cellular type shown in Figure 6, the difference being that in Figure 7, the electronic, ionic, or thermionic gravitator units are utilized. This motor may appropriately be designated as a gravitator motor of the electronic, ionic, or thermionic type, respectively.

The gravitator motors of Figure 6 and 7 may be supplied with the necessary electrical energy for the operation and resultant motion thereof from sources outside and independent of the motor itself. In such instances they constitute external or independently excited motors. On the other hand, the motors when capable of creating sufficient power to generate by any method whatsoever all the electrical energy required therein for the operation of said motors are distinguished by being internal or self-excited. Here, it will be understood that the energy created by the operation of the motor may at times be vastly in excess of the energy required to operate the motor. In some instances the ratio may even be as high as a million to one. Inasmuch as any suitable means for supplying the necessary electrical energy, and suitable conducting means for permitting the energy generated by the motor to exert the expected influence on the same may be readily supplied, it is now deemed necessary to illustrate the details herein. In said self-excited motors the energy necessary to overcome the friction or other resistance in the physical structure of the apparatus, and even to accelerate the motors against such resistance, is believed to be derived solely from the gravitational field or the energy of gravitation. Furthermore, said acceleration in the self-excited gravitator motor can be harnessed mechanically so as to produce usable energy or power, said usable energy or power, as aforesaid, being derived from or transferred by the apparatus solely from the energy of gravitation.

The gravitator motors function as a result of the mutual and unidirectional forces exerted by their charged electrodes. The direction of these forces and the resultant motion thereby produced are

usually toward the positive electrode. This movement is practically linear. It is this primary action with which I deal.

As has already been pointed out herein, there are two ways in which this primary action can accomplish mechanical work. First, by operating in a linear path as it does naturally, or second, by operating in a curved path. Since the circle is the most easily applied of all the geometric figures, it follows that the rotary form is the most important. While other forms may be built it has been considered necessary to explain and illustrate only the linear and rotary forms.

The linear form of cellular gravitator is illustrated in detail in Figures 8, 9 and 10. It is built up of a number of metallic plates alternated or staggered with sheets of insulating material (Figure 3). Each pair of plates so separated by insulation act as one gravitator cell, and each plate exhibits the desired force laterally. The potential is applied on the end plates and the potential is divided equally among the cells. Each metallic plate in the system possesses a force usually toward the positively charged terminus, and the system as a whole moves or tends to move in that direction. It is a linear motor, and the line of its action is parallel to the line of its electrodes.

There are three general rules to follow in the construction of such motors. First, the insulating sheets should be as thin as possible and yet have a relatively high puncture voltage. It is advisable also to use paraffin-insulated insulators on account of their high specific resistance. Second, the potential difference between any tow metallic plates should be as high as possible and yet be safely under the minimum puncture voltage of the insulator. Third, there should, in most cases, be as many plates as possible in order that the saturation voltage of the system might be raised well above the highest limit upon which the motor is operated. Reference has previously been made to the fact that in the preferred embodiment of the invention herein disclosed the movement is toward the positive electrode. However, it will be clear that motion may be had in the reverse direction determined by what I have just termed "saturation voltage", by which is meant the efficiency peak or maximum of action for that particular type of motor; the theory, as I may describe it, being that as the voltage is increased the force or action increases to a maximum which represents the greatest action in a negative-to-positive direction. If the voltage were increased beyond that maximum the action would decrease to zero and thence to the positive-to-negative direction.

Referring more specifically to Figures 8, 9 and 10, red fiber end plates 1 act as supports and end insulators, and the first metallic plate 2 (for example aluminum) is connected electrically, through the fiber end plate, with the terminal 5. The second insulating sheet 3 is composed, for example, of varnished cambric, sometimes known as "empire cloth". The relative size and arrangement of the metallic plate and insulating sheets are best seen in Figures 9 and 10. A paraffin filler H is placed between adjacent insulating sheets and around the edges of the metallic plates (Figure 10a) and 6 represents a thin paraffin coating over the whole motor proper. 7 and 8 indicate successive layers of "empire cloth" or similar material, and 9 is a binding tape therefore. A thin film of a substance such as black spirit varnish 10 protects and insulates the entire outer surface. A phosphor bronze safety gap element 11 is connected electrically with the terminal (not shown) opposite to the terminal 5. A safety gap element corresponding with the element 11 is electrically connected with the terminal 5, but it has not been shown, in order better to illustrate interior parts. The purpose of the safety gaps is to limit the voltage imposed on the motor to the predetermined maximum and to prevent puncture.

The rotary motor (Figures 11, 12 and 13) comprises broadly speaking, an assembly of a plurality of linear motors, fastened to or bent around the circumference of a wheel. In that case the wheel limits the action of the linear motors to a circle, and the wheel rotates in the manner of a

fireworks pinwheel. The illustrations I have given are typical. The forms of Figur3s 6 and 7 have been defined. In Figure 11, the insulating end disk 1a has an opening 2a therethrough for an extension of the shaft 12. The disk 1a is secured to a suitable insulating motor shell, by fiber bolts or screws in any convenient manner, there being another of these disks at the opposite end of the shell, in the same manner as the opposite end plates 1 in Figure 8. The cells are built upon an insulating tube 11a disposed about the shaft-space 3a. Thick insulating wedges 4a separate the four linear motors illustrated. These thick insulating wedges, so-called, are substantially greater in body than the aggregate insulating sheets of the units. In some instances, however, dependent upon materials employed for the charged elements and the insulating members, this need not necessarily be the case. In each motor of this circular series of motors, there are the alternate sheets of insulation 5a associated with the alternate metallic plates 6a; paraffin fillers 71 along the edges of the plates 6a and between the insulating sheets 5a being employed similarly to the use of paraffin in Figure 8. The rotary motor is encircled by metallic (preferably copper) collector rings 10a, which are connected with the end metallic plates of the separate linear motors at 9a and 13 (Figure 12), one of these connections 9 being shown in detail where the insulating tube is cut away at 8 (Figure 11).

It is unnecessary herein to illustrate a housing or bearings because any insulated housing and good ball bearings, conveniently supplied, will complete the motor. The potential is applied to the safety gap mounted on the housing and thence is conducted to the collector rings of the motor by means of sliding brushes.

While I have in the foregoing Specification outlined, in connection with the broader aspects of my invention, certain forms and details, I desire it understood that specific details have been referred to for the purpose of imparting a full and clear understanding of the invention, and not for the purposes of limitation, because it should be apparent that many changes in construction and arrangement, and many embodiments of the invention, other than those illustrated, are possible without departing from the spirit of the invention or the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I clam is:

(1) A method of producing force or motion, which comprises the step of aggregating the predominating gravitational lateral or linear forces of positive and negative charges which are so cooperatively related as to eliminate or practically eliminate the effect of similar and opposing forces which said charges exert.

(2) A method of producing force or motion, in which a mechanical or structural part is associated with at lest two electrodes or the like, of which the adjacent electrodes or the like have charges of differing characteristics, the resultant, predominating uni-directional gravitational force of said electrodes or the like being utilized to produce linear force or a motion of said part.

(3) A method according to Claim 1 or 2, in which the predominating force of the charges or electrodes is due to the normal gravitational field and the imposed electrical field.

(4) A method according to Claim 1, 2, or 3, in which the electrodes or other elements bearing the charges are mounted, preferably rigidly, on a body or support adapted to move or exert force in the general direction of alignment of the electrodes or other charge-bearing elements.

(5) A machine or apparatus for producing force or motion, which includes at least two electrodes or like element adapted to be differently charged, so relatively arranged that they produce a combined linear force or motion in the general direction of their alignment.

(6) A machine according to Claim 5, in which the electrodes are mounted, preferably rigidly, on a mechanical or structural part, whereby the predominating uni-directional force obtained from the electrodes or the like is adapted to move said part or to oppose forces tending to move it counter to the direction in which it would be moved by the action of the electrodes or the like.

(7) A machine according to Calim 5 or 6, in which the energy necessary for charging the electrodes of the like is obtained either from the electrodes themselves or from an independent source.

(8) A machine according to Claim 5, 6, or 7, whose force action or gravitational power depends in part on the gravitational field or energy of gravitation, which is controlled or influenced by the action of the electrodes or the like.

(9) A machine according to any of Claims 5 to 8, in the form of a motor including a gravitator cell or gravitator cellular body, substantially as described.

(10) A machine according to Claim 9, in which the gravitator cellular body or an assembly of the gravitator cells is mounted on a wheel-like support, whereby rotation of the latter may be effected, said cells being of electronic, ionic or thermionic type.

(11) A method of controlling or influencing the gravitational field or the energy of gravitation and for deriving energy or power therefrom comprising the use of at least two masses differently electrically charged, whereby the surrounding gravitational field is affected or distorted by the imposed electrical field surrounding said charged masses, resulting in a uni-directional force being exerted on the system of charged masses in the general direction of the alignment of the masses, which system when permitted to move in response to said force in the above mentioned direction derives and accumulates as the result of said movement usable energy or power from the energy of gravitation or the gravitational field which is so controlled, influenced, or distorted.

(12) A method of and the machine or apparatus for producing force or motion by electrically controlling or influencing the gravitational field or energy of gravitation, substantially as hereinbefore described with reference to the accompanying drawings.

Harry W. BULL Reaction Motor

Popular Science Monthly **(January 1935), p. 27**

"Mysterious New Aircraft Powered by Reaction Motor"

Imagine a heavier-than-air flying craft devoid of any visible means of propulsion, which rises from the earth and travels through the air in apparent defiance of gravity. Lifting itself by its own bootstraps, by slinging weights about its interior, it could navigate at will in the stratosphere or even in the unknown reaches of outer space. Such a craft is brought within the realm of speculation by pioneer experiments of Harry W. Bull, of Syracuse, NY, with an entirely new form of propulsion that he terms the reaction motor.

Suspended from a pair of light, flexible wires, in his laboratory, hands a cylindrical tube about a foot long. At the touch of an electric switch, it becomes alive and leaps forward, as if drawn by

some invisible magnet. Actually the power plant, a curious system of reciprocating weights, is contained within the tube itself.

This elementary form of reaction motor operates on a principle that has long been neglected by engineers, but which Bull believes can be applied in aircraft and other vehicles. It depends upon the difference in effectiveness of two ways of transmitting energy, which can be termed impact and impulse. If a weight is thrown against a solid wall, it is stopped by impact, and much of its energy is wasted in distorting the weight and wall and in producing heat. However, if the weight is thrown against a spring fastened to the wall, it is stopped by impulse, the spring conserving the energy of the moving weight and transmitting the resulting force, with little loss, to the wall. Tests have shown a weight will yield three times more force by impulse than by impact.

Figure 1 ~ Here is our artists's conception of the proposed globular aircraft which is to be driven by shifting weights.

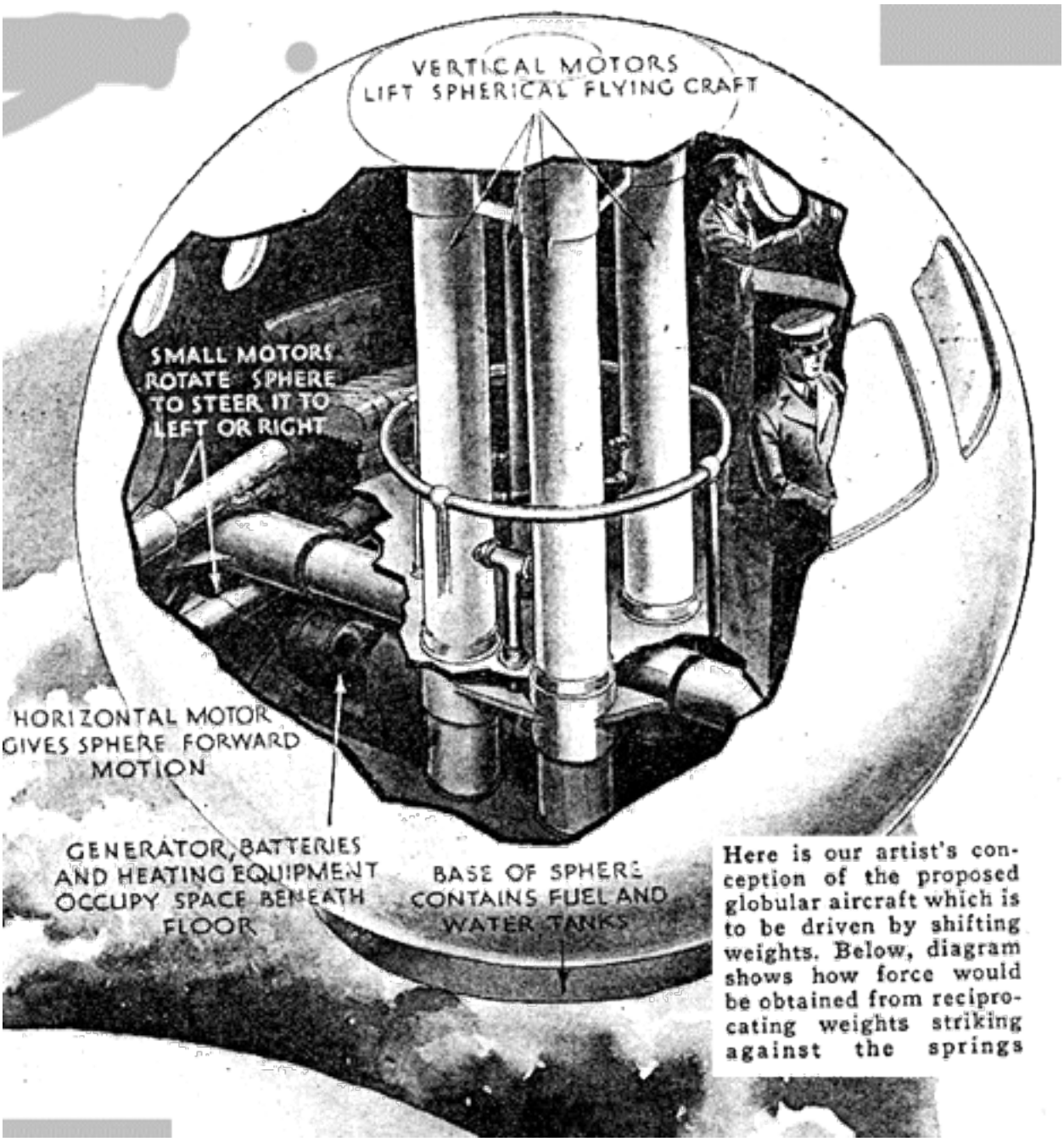

VERTICAL MOTORS LIFT SPHERICAL FLYING CRAFT
SMALL MOTORS ROTATE SPHERE TO STEER IT TO LEFT OR RIGHT
HORIZONTAL MOTOR GIVES SPHERE FORWARD MOTION
GENERATOR, BATTERIES AND HEATING EQUIPMENT OCCUPY SPACE BENEATH FLOOR
BASE OF SPHERE CONTAINS FUEL AND WATER TANKS
Here is our artist's conception of the proposed globular aircraft which is to be driven by shifting weights. Below, diagram shows how force would be obtained from reciprocating weights striking against the springs

Figure 2 ~ Diagram shows how force would be obtained from reciprocating weights striking against the springs.

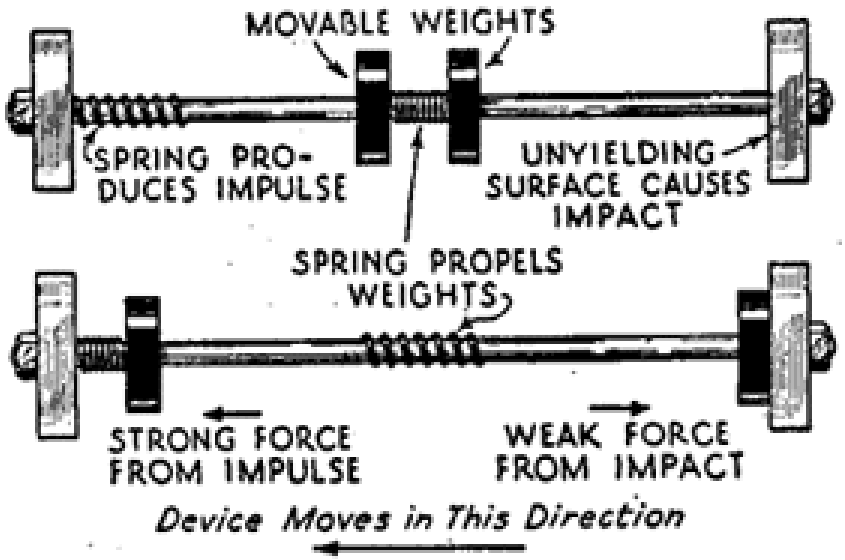
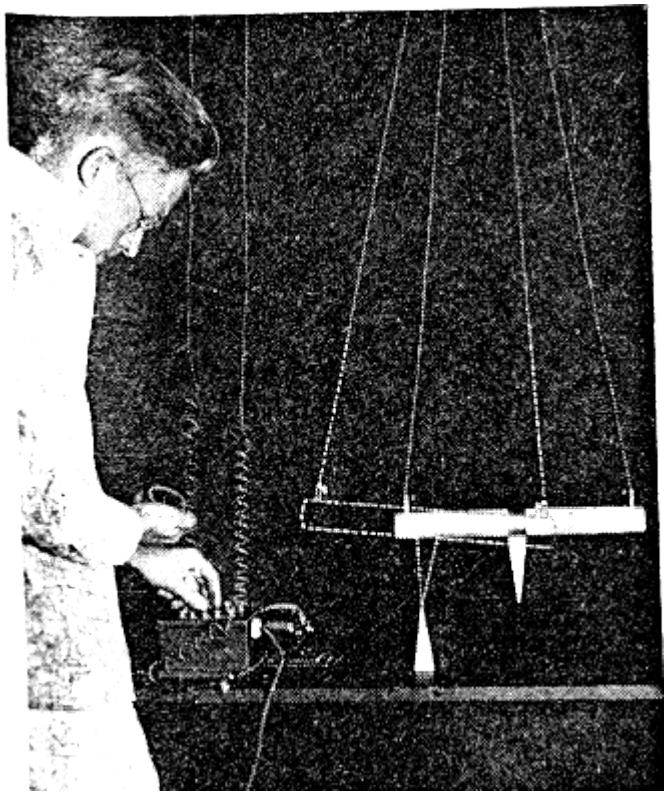


Figure 3 ~ Harry W. Bull, inventor, exhibits an experimental model of his reaction motor with which he hopes to power an aircraft that will, apparently, defy gravity. When the power is shut off the two pointers, above, coincide. Weights in the device are operated by electromagnets.



Applying this principle in the manner shown in the accompanying diagram, he mounts two movable weights in a cylinder and starts them simultaneously in opposite directions. One is

stopped by a flat steel plate, and the other by a spring. The difference in the effectiveness of the two blows, as explained above, is sufficient to kick the cylinder forcibly in the direction of the spring. The weights may be returned to their original positions by any standard mechanical means, and the cycle repeated continuously, providing a steady and self-contained driving force without recourse to propellers, rocket jets, or any other familiar means of propulsion.

From the present experimental model to a reaction motor powerful enough to lift aircraft seems a long step. Achieving a practical reaction motor, Bull points out, depends to a large extent, paradoxically, upon how inefficient it can be made. The more force that can be wasted in impact, the greater force will be left to push ahead, a new problem for engineers, who have spent years trying to conserve energy rather than dissipate it. Likewise, much experimentation remains to be done upon the impulse side of the apparatus, which is still far from efficient.

Supposing these difficulties overcome, what would an airship, driven by a reaction motor, look like? Bull visualizes a globular craft with a motor in the form of an upright cylinder containing two pistons operating in opposite directions, one delivering an impulse and the other an impact. A carburetor adapted for mixing vaporized oxygen and gasoline would supply an explosive mixture to drive the pistons. Several cylinder units could be used to obtain a steady lifting force. Others placed horizontally would provide forward motion. A similar impulse-impact cylinder of reduced size, operated electrically and mounted near the outer shell of the ship, would rotate the craft for steering. An airship driven by this new method could travel at high speed and could be used at either high or low altitudes.

Journal of the American Rocket Society **29: 7-8, (Sept. 1934)**

"(5) Entirely New Reaction Methods"

by

Harry W. Bull

An entirely new means of securing a reaction was next tested. The rocket was made up of a series of chambers the ends of which consisted of steel disks fastened together by a 1/4 inch diameter steel rod. The chambers were arranged to explode in series, blowing the steel disks downward with great velocity. Knowing the weight of the disk and its velocity and also the weight of the complete rocket it is a simple matter to find the energy of the recoil. Although this type of rocket works, it leaves much to be desired in the line of safety.

A series of tests now followed which I believe are original in the field of reaction. They dealt with a form of impact-impulse reactions which are created mechanically. The apparatus if placed in a box in space would move without the use of a jet of any sort, it being propelled by a reciprocating motion of two weights. The truth of the theory may be easily proven by a very simple apparatus.

The theory is that a large weight with a low velocity (if stopped by springs) will yield more foot pounds of energy than a small weight with a high velocity being stopped by impact, even though both were given the same initial force. A simple illustration: Let us assume you are in the center of a room in space. One wall is elastic and the opposite one solid. In your hands are two balls one heavy and the other light and you throw them with the same force at the same time. The heavier one hits the elastic wall with an impulse and a large amount of energy is given to the room in that direction. The lighter one having the same energy hits the solid wall but its energy is dissipated

in heat and distortion. If there could be found a method whereby the kinetic energy of the lighter ball could be effectively utilized the room would move in the other direction.

Charles F. BRUSH Kinetic Theory of Gravitation

"A Kinetic Theory of Gravitation"; *Nature* 86:130-132, March 23, 1911

Letter to the Editor (Sir Oliver Lodge); *Nature* (March 30, 1911)

"Gravitation"; *Proc. Amer. Philos. Soc.* 68: 55-68 (May 1929)

Bibliography

***Nature* 86: 130-132 (March 23, 1911)**

A Kinetic Theory of Gravitation

by

Charles F. Brush

Ever since Sir Isaac Newton enunciated the law of universal gravitation, more than 200 years ago, philosophers have speculated on the nature of that mysterious agency which links every atom of mater in the universe with every other atom. Newton found himself unable to offer any adequate explanation.

Since Newton's time several theories of gravitation have been proposed; but all, of which I am aware, are open to strong objections, and are not considered even promising by physicists.

Study of the nature of gravitation is beset with unusual difficulties, because gravitation is ever with us and about us; it is the one universal phenomenon, and we cannot escape from its influence -- cannot obtain any outside point of view.

Gravitation is often described as a feeble force: and so it is, from one point of view. It is difficult to measure, or even to detect, attraction between two small bodies. But when the bodies are pf planetary size the aggregate attraction of their molecules is enormous. It is easy to calculate that the attraction between the earth and the moon, which is just sufficient to retain the latter in its orbit, would, if replaced by a steel cable, require that the cable be about 500 miles in diameter in order to withstand the strain. Between the earth and sun, the cable would have to be nearly as large in diameter as the earth: and attraction between the components of double stars is millions of times greater than between the earth and sun (Lodge). So tremendous a phenomenon as gravitation, a phenomenon compared with which all others seem trivial, must have a mighty origin.

That gravitation is a phenomenon of the all-pervading aether is beyond reasonable doubt. This is so generally conceded that it need not be argued. But how does the gravitative influence

originate? How is it transmitted and maintained? What is the mechanism of gravitation? It is the purpose of this paper to attempt an answer to these questions.

Let us consider what happens to a falling body. We know that it gathers kinetic energy from some source, as evidenced by its acceleration; that this energy may do external work or develop heat; that the amount of energy gathered is measured directly by the distance fallen through (within the limits of uniform gravitation), irrespective of the time or rate of falling. When the distance fallen through is of inter-planetary magnitude, and the attracting body large, the gathered energy is enormous, sufficient, if converted into heat, to vaporize the most refractory falling body.

We are here confronted with the question, Whence comes the energy acquired by a falling body? Certainly it was not inherent in the body before the fall, as evidenced by the fact that during unimpeded fall none of the physical or chemical attributes of the body, aside from the acquired motion, changes in the slightest degree.

We have been taught that before the fall the body was endowed with "potential energy of position" which is converted into kinetic energy during the fall. I think "energy of position" is an unfortunate term, because it is so very inadequate. To me it explains nothing. The case is not like that of a flexed spring, where there is internal molecular strain or displacement.

Let us imagine a pound-weight of iron, for instance, raised from the surface of the earth to a point near the moon in a line joining the centers of the two bodies, the point so chosen that the opposing attraction of the earth and the moon shall exactly balance each other, leaving orbital motion out of consideration.

On the surface of the earth the two-pound weight had some so-called "potential energy of position", because it was capable of falling into a pit; but in its new position near the moon, this potential energy not only has not been augmented, but has disappeared entirely; the pound-weight, left free to move, remains stationary; and yet we must have expended more energy in overcoming the attraction of the earth and lifting the weight to its new position. This amount of energy would be sufficient to impart to the weight a velocity more than 10 times greater than that of the swiftest cannon-ball, or, if converted into heat, would be many times more than sufficient to raise the iron weight to dazzling incandescence and then vaporize it. Now, in lifting the weight, this large amount of energy has disappeared utterly. We cannot believe that the whole or any part of it has been annihilated; it must, in some form, be resident somewhere. I think no one will contend that this energy is resident, in any form, in the cold, motionless pound-weight. I believe it was absorbed by, and is now resident in, the aether through which it falls. This is a fundamental idea to which I invite attention. Faraday glimpsed it long ago, and others have appreciated it more clearly since his time. But, so far as I am aware, no one has realized its significance.

This view of gravitation implies that the aether is endowed with very great intrinsic energy in some form. Many men of science now hold that the aether is so endowed, and that the amount of this intrinsic energy is enormous. Sir Oliver Lodge ("The Ether of Space") appears to regard this energy as potential in form, and estimates the intrinsic energy of a single cubic millimeter of the aether to be almost inconceivably vast. He says, "All potential energy exists in the ether". Sir J.J. Thomson says, "All kinetic energy is kinetic energy of the ether".

I conceive the aetherial energy involved in gravitation to be kinetic rather than potential, the latter involving strain or stress. Newton, and later Maxwell, assumed that bodies produce a stress in the aether about them of such nature as to account for gravitation, but they were unable to imagine any physical cause for the stress.

All the past theories of gravitation of which I am aware, except the corpuscular theory of La Sage, appear to regard gravitating matter as the seat of the gravitative influence, the surrounding aether, by induced stress or otherwise, acting simply as the medium of transmission. I cannot see that any of these theories account for the energy acquired by a falling body.

My own view of gravitation differs from these radically. I believe that kinetic energy of the aether is the fundamental cause of gravitation, and that a gravitating body plays a secondary role only in disturbing the normally uniform distribution of the aether's energy, in manner I shall endeavor to explain later.

Let us assume, then, that the aether is endowed with very great kinetic energy normally uniform in distribution.

Kinetic energy implies motion of something possessed of inertia. Now, inertia is a fundamental attribute of the aether. The aether is highly elastic also, which, with its inertia, enables it to possess kinetic energy in wave form, as exemplified in radiation. By the term wave, I mean progressive motion locally periodic; doubtless the aether as a whole is stationary. Hence we may consider the kinetic energy of the aether as consisting in aether waves of some kind.

These waves, vast in aggregate energy, eternal in persistence, without finite source or destination, are imagined as being propagated in straight lines in every conceivable direction. The isotropic distribution of kinetic energy, essential to my theory of gravitation, was, for me, a difficult conception until I reflected that isotropic radiant energy is approximately realized in the interior of any furnace with uniformly heated walls.

Any kind of waves capable of exerting motive action on the atoms or molecules of matter will fulfill the requirements; but I shall first consider the transverse, electromagnetic waves of radiation, because these are the kind of aether waves we are familiar with.

Of course, intrinsic aether waves, if of the radiation kind, cannot be of any frequency at present known to us as radiation, because then all bodies would become heated. But we can easily imagine them of such extremely low frequency that the molecules or atoms of matter cannot respond to them -- cannot vibrate in unison with them -- molecular resonance cannot be established; hence no conversion of the aether's energy directly into heat in the ordinary way can take place.

We are familiar with the dissipation or degeneration of the higher forms of energy into heat, and the continual degradation of heat to lower degree; that is to say, less violent molecular vibration and more general distribution. As is well known, it is only through this degradation or running down of natural energy that we are enabled to utilize some of it. Lord Kelvin called this function of energy "motivity" (we now call it entropy), and said the motivity of the universe tends to zero.

We know that ordinary radiation waves in the aether persist indefinitely and without change of frequency or direction until they encounter matter, when they are absorbed and converted into heat, only to be radiated again, usually in longer waves, to some cooler body. This degradation of wave frequency continues until we can no longer follow it. I beg to suggest that the ultimate destination of this wave energy is that vast reservoir of kinetic energy intrinsic to the aether. We may liken the waves of radiant energy, which we apprehend as light and heat, to wind ripples on the surface of water, which continually degenerate in wave frequency until they are absorbed into and become part of a mighty swell of the ocean.

Thus we may, perhaps, regard the aether's intrinsic energy as energy in its lowest form -- Kelvin's zero of "motivity". But unfortunately we may, and do, get some of this energy back in

available form in many ways, as, for instance, when a falling body is arrested and develops heat; some of our wind ripples are then returned to us.

When two gigantic astronomical bodies collide under the influence of gravitation, as sometimes happens, we witness in far distant space the birth of a nebula. The inconceivably vast amount of heat developed by the collision converts both bodies into luminous vapor, which expands with incredible rapidity into the nebulous cloud. This heat energy must in course of time degenerate back into the aether whence it came, though billions of years may be required; and during all this time the energy has "motivity". We may picture the stupendous result of the collision as only a local splash in the aether's mighty ocean of energy.

Having postulated that the aether is endowed with very great intrinsic kinetic energy in wave form of some kind, that the waves are propagated in straight lines in every conceivable direction, i.e., the wave energy is isotropic, and that this energy is distributed uniformly throughout the universe except in so far as the distribution is disturbed by the presence of matter, I shall endeavor to explain my conception of the mechanism of gravitation.

For illustration in terms of the known, let us imagine a closed space having uniformly luminous walls of such character that every point on their surface radiates light in all internal directions. The enclosed space may be of any shape, but for the sake of simplicity let it be spherical or cubical, and large, say as large as a lecture-room. The space will be filled with isotropic radiant energy uniformly distributed -- any cubic centimeter of space containing as much energy as any other.

Next let us picture a small opaque body suspended anywhere in our luminous sphere. The body may be of any shape we may imagine an atom or molecule to have; but, again for simplicity, let it be spherical -- say a small grain of shot, and let it be located near the center of the space.

The small body will absorb the light which falls upon it, and will cast a spherical shadow, the depth or intensity of which will vary inversely with the square of the distance from the center of the body; and the shadow will extend to the confines of the enclosure, however large the latter may be. We cannot perceive the shadow but we know it is there. It is true that the body will soon acquire the temperature of its surroundings, and radiate as much energy as it receives; but for the purpose of this illustration let us consider only the high-frequency light energy.

As is well known, the aether waves of light will exert a slight pressure on the body. But in the case supposed the pressure will be equal on all sides, and no effort toward translation can result.

Now let us introduce a second small body, similar to the first, and some distance from it. This will also cast a spherical shadow like the first. The first two shadows will intersect, and each body will lie within the shadow of the other. In other words, each body will be partially shielded by the other from the aether waves coming from that direction. Hence the light pressure will be less on that side of each body which faces toward the other than on the side which is turned away, and the bodies will be urged toward each other by the excess of light pressure on the side turned away. This excess of pressure will vary with the inverse square of the distance between the centers of the bodies so long as the ratio of distance to diameters remains large.

The aether waves concerned in gravitation cannot, however, be like the light wave I have just used for illustration, because light waves heat bodies on which they fall; and their pressure is almost wholly superficial, it does not reach molecules much below the surface, and hence bears little relation to mass.

But let us substitute for the short and feeble waves of light powerful waves, still of the radiant kind, but of such great length and slow frequency that, as before explained, they do not excite the

molecular vibrations which we appreciate as heat, and hence are not absorbed by matter; they pass freely through all bodies, bathing the interior molecules as effectively as those on the surface.

Under these conditions each molecule or atom or unit of a gravitating body will have its own spherical shadow or field of influence, and the gravitative force acting on the body will vary directly with the sum of its units, i.e., with its mass.

The spherical shadow which I have pictured as the field of influence of each atom or material unit implies that the atom has caused, principally in its immediate neighborhood, a diminution of the aether's energy. Let us further imagine this subtracted energy resident in the atom as kinetic energy of translation in many paths, almost infinitesimally short and in every direction, but without collisions, because neighboring atoms follow very nearly parallel paths. We may then picture the collective atoms or molecules of matter buffeted in every direction by the aether waves in which they are entangled, like a suspended precipitate in turbulent water.

Each atom or molecule may be regarded as a center of activity due to its kinetic energy of translation, with continual absorption and restitution of the aether's energy, normally equal in amount. The manner in which this molecular activity maintains, in effect, the supposed spherical shadow, requires explanation, which I shall attempt in a future paper.

Of the several components into which the composite motion of each atom can be resolved, that one lying in the direction of an attracting body will be the greatest, because the waves from that direction, being partially intercepted by the attracting body, are weakest, and the atom will be pushed in that direction by the superior waves behind it than it restores to the weaker waves in front, and will thus acquire additional kinetic energy of translation in the line of fall, measured directly by the number of waves involved, i.e., by the distance moved. Conversely, if the atom be forced away from the attracting body, restitution of energy will exceed absorption, and the energy expended in moving the atom against attraction will be transferred to the aether.

It will be seen that gravitation is a push toward the attracting body, and not a pull. It is clear, also, that the velocity which a falling body can acquire tends asymptotically to a limit, which is the velocity of the aether waves which push it -- the velocity of light, if transverse waves are involved

I have already intimated that any kind of aether waves capable of imparting motion (not internal vibration) to the atoms of matter will fulfill the requirements of my theory, but have thus far discussed only transverse waves.

Let us now consider longitudinal waves -- waves of compression and rarefaction, like sound waves in air and in elastic liquids and solids. The "spherical shadow" conception which I have employed in connection with transverse waves applies equally well here.

So far as I am aware, longitudinal waves in the aether are unknown, but that such waves have not been observed is not convincing argument that they do not exist.

Assuming, then, that some, or perhaps much, of the intrinsic energy of the aether is embodied in longitudinal waves, we have only to find some motive action of such waves on atoms to account for gravitation. Adequate motive connection may perhaps be effected by the locally alternating flow and ebb -- acceleration and retardation of the aether in which the atoms are enmeshed, incident to its wave motion. We have ample reason for believing that does obtain a grip of some sort on the atoms of an accelerating (falling) body and a retarding (rising) body, from which it follows that accelerating and retarding aether, as in a wave of compression, must grip a comparatively stationary atom.

Certain facts of astronomy apparently require that gravitational attraction between bodies, however distant from each other, must, in effect, be instantaneous; that is to say, the line of apparent attraction between them is a straight line adjoining their centers. I believe my theory meets this condition, but shall reserve discussion of the point for a future paper.

I feel much diffidence in presenting the foregoing rough draft of a theory of gravitation, but I cannot avoid the belief that it contains some germs of truth, perhaps the real key to the great mystery, though, if this be true, I have no doubt used the key clumsily and imperfectly.

If the aether theory of gravitation is, in the main, the true one, it offers some hope of experimental verification. Provided the waves are of one principal frequency, or even of several, we may find something, doubtless of molecular magnitude only, which will oscillate in unison with them so that resonance can occasionally be established and a cumulative effect be obtained sufficient to manifest itself as heat.

In searching for some natural phenomenon of this nature, I thought of the thermal condition of the upper atmosphere as a possible case. The mean molecular velocity of a gas at some temperature, in connection with the mean free path of its molecules at some particular pressure or pressures, may possibly afford the necessary conditions for fortuitous resonance, with development of some slight amount of heat by the increased violence of inter-molecular collisions. I have done much experimental work on these lines during the past year, but, notwithstanding refinement of method and manipulation, the results have thus far been unsatisfactory. The work is till in progress, however, and investigation of other phenomena is contemplated.

Nature **(March 30, 1911)**

Letters to the Editor: Sir Oliver Lodge
Re: A Kinetic Theory of Gravitation

The subject of Mr. Brush's article in *Nature* of March 23 (p. 129) is certainly of profound interest, and will continue to be so until the problem as to the nature of gravitation is solved. Meanwhile, a few questions raised are comparatively simple. Anyone asked, Where lies the energy of a raised weight? Must surely reply, "In the aether", i.e., in the medium, whatever it is, that is driving the weight down towards the earth. A critic who either doubts or asserts this will not be confused -- as Mr. Brush suggests he will be -- by the suggestion that the weight might be raised up so high as to reach the neutral point between the earth and moon -- a suggestion which carries with it the tacit questions, "Where is the energy now?" and "What has become of the work done?" -- for this case is no more troublesome than the case of a weight raised and hung on a hook. Something -- some opposition force -- sustains the weight, i.e., opposes the pull of the earth, and it matters little whether the opponent be a shelf beneath it or the moon above it. The important thing to understand is the nature of the downward propelling force -- indeed, of both the upward and the downward force -- in either case.

The question whether the energy of a raised weight is potential or kinetic is of little or no importance. The energy is certainly potential, according to our definition of potential. So is the energy of a strained spring: for there also the atoms are separated against their mutual (cohesive) attraction, and there again the energy really resides in the aether. But that all energy may turn out to be ultimately kinetic -- when we come to understand what elastive stress fundamentally is -- that proposition is not negatived in the least.

Mr. Brush proposes a shadow theory of gravitation, a modification of Le Sages's theory except that the pressure is supposed due to the non-syntonic impact of waves traveling in all direction, instead of to a bombardment of utterly minute particles flying at random. There is nothing new in a shadow theory, and all such theories are faced with the difficulty of plausibly explaining the absence of noticeable screening -- a difficulty which is bound to reduce them to acquiescence in an approximation.

The contribution which Mr. Brush makes to the discussion is the suggestion that the supposed gravitational aether-waves are the result of accumulated thermal radiation from all past and present suns, the wave-lengths having automatically increased during their long storage.

To this view several objections might be urged -- one of them being that in that case the constant of gravitation would be secularly increasing; another, that it should be greater in a hot enclosure, say the interior of a sun, than elsewhere; but a more salient objection is raised by the inquiry as to which is cause and which is effect. How did the bodies get hot and so radiate? Was not their heat perhaps due to their having clashed together with gravitational energy itself derived from the aether?

The fact is that every question concerning origin involves us always with insuperable puzzles, and that is just the main difficulty about gravitation. An atom of matter, by its very existence, sets up a fixed stress in the aether, varying directly as the mass and inverse as the distance -- that is only another way of stating the law of gravitation; we are trying to understand the nature and cause of that stress. It appears to be one of the fundamental properties of matter, and until we can understand what is meant by the generation or destruction of an atom -- i.e., of an electron if that is the fundamental unit -- we are hardly likely to understand its gravitational influence more than any other of its fundamental properties -- including, perhaps, existence itself.

Let this not be understood as a negative prediction or estimate of impossibility -- such predictions are always absurd; it may be that when the structure of an electron is understood, we shall see that an "even-powered" stress in the surrounding aether is necessarily involved. What I do feel instinctively is that this is the direction for discovery, and what is needed is something internal and intrinsic, and that all attempts to explain gravitation as due to the action of some external agency, whether flying particles or impinging waves, are doomed to failure; for all these speculations regard the atom as a foreign substance -- a sort of "grit" in the aether -- driven hither and thither by forces alien to itself. When, some day, we understand the real relation between matter and aether, I venture predict that we shall perceive something more satisfying than that.

Oliver Lodge
University of Birmingham
March 25, 1911

***Proc. Amer. Philos. Soc.* 68: 55-68 (May 1929)**

Gravitation

by

Charles F. Brush

At the Minneapolis meeting of the American Association for the Advancement of Science in December 1910, I had the honor to outline "A Kinetic Theory of Gravitation" (Ref. 1). This was followed by a "Discussion" of the theory in 1914 (Ref. 2) A second "Discussion" came in 1921 (Ref. 3) A third "Discussion" in appeared in 1926 (Ref 4).

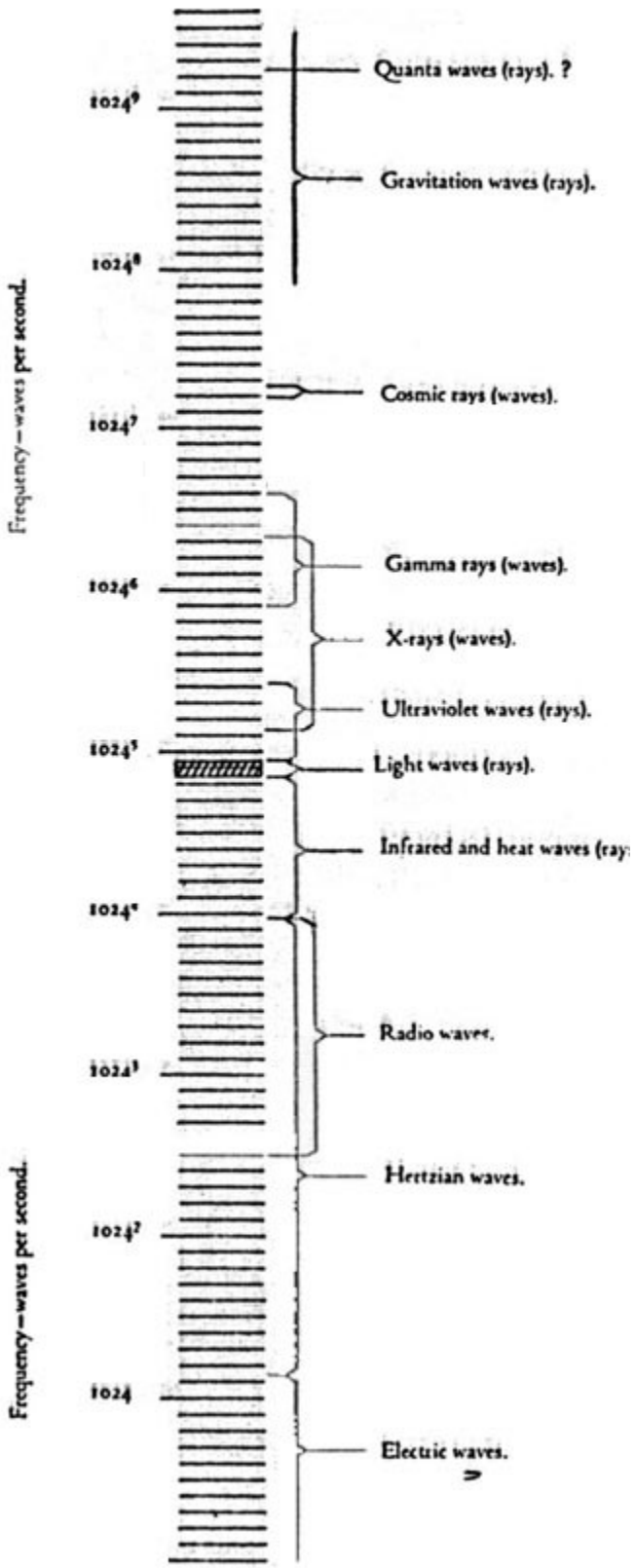
The later paper contains a concise synopsis of the theory and very convincing argument supporting my contention of 1910, that the energy acquired by falling bodies is derived from the ether.

This Kinetic Theory of Gravitation postulates that the ether is endowed with vast intrinsic energy in the form of waves propagated continually in every conceivable direction, so that the wave energy is isotropic. The belief expressed is that all energy is primarily energy of the ether.

The very high-frequency ether waves, which embody most of the ether's intrinsic energy, pass freely through matter without obstruction except that concerned in gravitation, and a very small heating effect (which will be explained later). The ether waves exert motive action on atoms or particles of matte whereby the latter are buffered about in all directions with some absorption of ethereal energy. Thus a lump of matter casts a spherical energy shadow into space, the depth of shadow diminishing with the square of the distance from its origin. The energy shadows of two or more bodies interblend, so that energy density between them is less than elsewhere, and they are pushed toward each other by the superior wave energy from directions beyond them. The 1926 paper (Ref. 4) explains this at length.

To aid in forming a mental picture of the relation of the very high-frequency ether waves postulated as the cause of gravitation, to other well-known classes of ether waves, I have prepared the chart of ether-wave frequencies shown in **Figure 1**.

GRAVITATION



Each horizontal line in the scale of frequencies represents double the frequency of the line below it, or half the frequency of the line above it. Thus the scale of frequency increases upward by octaves as in music.

Starting at the bottom of the scale with a frequency of one ether wave per second, the second line four waves per second, the third line eight waves per second, and so on to the tenth doubling where we get a frequency of 1,024 waves per second as shown. Continuing the doubling process another ten times we get a frequency of 1,024 time 1,024, or 1,024 to the second power, and so on up the scale to the third, fourth, and fifth, etc., powers of 1,024. Thus it is seen that the indicated wave frequency increases with great rapidity as we ascend the scale. At the 20th octave it is more than a million per second; at the 40th octave more than a million million waves per second.

I am indebted to a chart shown a the British Exposition in 1925; to a chart by G.L. Clark in 1927, and to a chart by W.E. Deming in 1929 for much of the material shown in my chart. But I have arranged it somewhat differently, emphasizing ether-wave frequency rather than wavelength.

Frequency is converted into wavelength by dividing the velocity of light per second by frequency of the waves per second. Thus the frequency 1 at the bottom of the chart means one wave per second, and its wavelength is the distance it would travel in one second, before another wave started after it. This is the velocity of light, about 186,000 miles, or about 300,000 kilometers. All ether waves travel at the same velocity.

A wave train of this very low frequency and very great wavelength could easily be launched into the ether by revolving a closed coil of wire on its own diameter as an axis, in a magnetic field, at the rate of one revolution per second. If we should increase its revolutions to ten per second, we would get a frequency of ten, and a wavelength of 18,600 miles. Such mechanically generated electric ether waves may be increased in frequency without much difficulty as far up as shown in the chart.

Next above we have Hertzian waves, covering about 28 octaves, generated by the condensor and sparkgap method. The upper half of of this long range of ether waves contains the waves used in radio transmissions and music.

Next above the Hertzian waves, of higher and higher frequency and shorter and shorter wavelength, we find the infrared and heat waves covering about 9 octaves. These waves embody most of the heat received from the sun, and nearly all the heat radiated from hot bodies below redness.

Then we cone to the exceedingly interesting and intensively studied light waves or rays. These cover barely one octave of the scale, and their mean frequency is about 500 million million waves per second. It seems unfortunate that the human eye is sensitive to such a short range of ether vibrations only, while the human ear can perceive about 11 octaves of sound, or air vibrations. Perhaps some animals or insects have a wider range of vision than humans.

Above the light waves we find about 5 octaves of ultraviolet waves. The sun’s radiation includes the last three classes of waves, though some of the ultraviolet is absorbed by our atmosphere and does not reach the earth. The ultraviolet rays or waves promote chemical action and are chiefly responsible for the ordinary photographic image.

Next in the growing range of frequency we have the well-known x-rays, so extensively used in x-ray photography for therapeutic and industrial purposes. These cover a long range of octaves in our chart, and overlap the upper part of the ultraviolet range and the lower part of the gamma range. X-rays, particularly those of the highest frequencies, pass rather freely through large

thicknesses of light substances such as wood, fabric, animal tissue and metals of low atomic weight and density; but metals of large density and high atomic weight absorb and obstruct them greatly. Thus a quarter inch of lead almost completely stops x-rays of the highest frequency. The ability of x-rays to pass deeply into or through matter, is called "penetrating power".

Above the x-rays in our chart are the gamma rays of radium, so extensively used in therapy. These have a much greater penetrating power than the highest-frequency x-rays.

All the above described classes of ether waves have been demonstrated experimentally, and doubtless all exist to some extent, permanently in the ether of space. Particularly is this true of the heat waves, as I pointed out in my 1927 paper (*Proc. Am. Phil. Soc*. LXVI, 1927). In that paper I showed, conclusively I think, that a lump of matter far out in inter-stellar space could not possibly fall to absolute zero by temperature radiation of all its heat, as commonly supposed, but would soon acquire and then maintain the "temperature of space" which I estimated to be something like 50* to 100* above absolute zero.

Above the gamma rays there are about 6 octaves which have not been explored experimentally. Then we come to the cosmic rays, so ably demonstrated and studied by Dr. Millikan. These cover considerably less than one octave, and their mean frequency is about 5,000 million million million waves per second. This is 10 million times greater frequency than light waves possess; and yet there can be no doubt that cosmic rays are ether waves like all the rest. As might be expected, cosmic waves, on account of their very much higher frequency (shorter wave length), have far greater penetrating power than the highest-frequency x-rays; in fact, about 300 times greater, as they pass through 6 feet of lead.

Starting considerably above cosmic rays in the chart, I have drawn a long bracket with indeterminate ends. Somewhere in this region lie the isotropic ether waves of gravitation, probably having considerable range of frequency. The enormous frequency of these waves enables them to pass freely through all kinds of matter without obstruction except that concerned in gravitation.

Probably most of the vast intrinsic energy of the ether lies in the region of the gravitation waves.

Until about a year and a half ago, we had no experimental evidence of the gravitation waves other than gravitation itself. But gravitation is a most impressive demonstration of the ether waves which cause it, and of the very great energy embodied in them. As illustrating both pints, I call attention to Lord Kelvin’s graphic word-picture of collision of two large astronomical bodies under the influence of their mutual gravitational attraction, which I have quoted in my 1914 paper ((Ref. 2) and my 1926 paper (Ref. 4) As another illustration of the enormous differential ether-wave push of astronomical bodies toward each other, let us consider the case of the earth and moon. The urge toward each other is commonly called gravitational attraction, which is only another way of looking at it. If this attraction were absent, and the moon were held in her orbit by a weightless steel cable, the cable would need to be about 500 miles in diameter to stand the strain. Between the earth and sun, the cable must be about 6,000 miles in diameter. And the attraction (push toward each other) of the components of some double stars must be thousands of times greater than this.

Obviously, the ether waves of gravitation, and the other classes of waves we have discussed, must be permanent attributes of the ether; they cannot escape from either boundless or bounded space. They must fill all space; and we may therefore regard gravitation as a property of space, because wherever there are two or more particles or bodies of mater, however small or large, however near or distant, they are urged toward each other by the ever-present isotropic ether waves of gravitation.

Very high up in the chart I have tentatively drawn the line marked "Quanta waves or rays", indicating a frequency of 6.54 x 1027.

Experimental Evidence of the Ether Waves of Gravitation:

A year ago I had the honor of presenting a paper under the title "Correlation of Continual Generation of Heat in Some Substances, & Impairment of Their Gravitational Acceleration" (*Proc. Am. Phil. Soc*. LXVI, No. 2, 1928).

This division of papers is a continuation of last year's paper; and to save the reader the bother of looking up that paper and its several references, I shall quote very freely from it and prior papers.

The third "Discussion" (1926; Ref. 4) contains in its title "Some Experimental Evidence Supporting Theory; Continual Generation of Heat in Some Igneous Rocks & Minerals".

"Heat is often defined as an agitation of atoms and molecules of matter, and measured by the total kinetic energy of such agitation. The agitation consists partly in internal vibrations of the elastic atoms and molecules and spinning about their various axes, and partly in very rapid transitory motion among themselves. Thus they are supposed to dart about in every conceivable direction, constantly colliding with each other and rebounding or glancing in new directions. The kinetic energy of this translatory motion constitutes sensible heat (not total heat) and is the measure of temperature. Anything (such as absorbed radiation) which stimulates the internal vibration of atoms or molecules likewise increases their translatory velocities by the increased violence of rebound after collision, and thus increases their temperature; and vice versa.

"All the above is known to be true of gases and vapors (kinetic theory of gases) and is generally believed to be true of liquids and solids.

"The 'mean free path' and the 'mean velocity' between collisions of the molecules of many gases under stated conditions have been computed. But it has also been shown mathematically that the higher and lower velocities, and the longer and shorter paths, differ greatly from the means, and may in each respect vary 20 or more times in amount. Doubtles this is true also of liquids and solids.

"From the fortuitously wide variation I velocities and free paths of the billions of vibrating atoms or molecules in their heterogenous movement, it follows that collision frequencies must also vary greatly, but have a wide range of frequencies as do the well-known x-rays.

"With the foregoing in mind it is easily conceivable that some kinds of matter may have atoms or simple molecules or complex molecules of occasional vibration frequency corresponding with some gravitation wave frequency, whereby fortuitous resonance can, for brief instants, be established at various points. This would result in a slight increase of vibrational activity and a cumulative rise of general temperature.

"A body of such matter, with some thermal insulation, would become and remain permanently warmer than a neighboring body similarly circumstanced, but not endowed, or less endowed with the permissive heat-generating quality".

A carefully designed calorimeter is illustrated and described in the paper (1926), and details of many experiments given. These resulted in the discovery that some rocks and minerals did generate an easily observable amount of heat.

In April 1927, I presented another paper on "Persistent Generation of Heat in Some Rocks & Minerals" (*Proc. Am. Phil. Soc.* LXVI). This is a continuation of the 1926 paper. It describes a new and different calorimeter, built in the spring of 1926, and since known as the "Ice Calorimeter". It has been in almost continuous use down to the present time (April 1928) and has

proved very satisfactory. With this calorimeter it has been found that some of the natural heat-generating materials, and some of the artificial silicates hereafter described, have retained their heat-generating activity unimpaired; and none of these substances is more than minutely radioactive. Quoting from the 1927 paper:

"It is notable that all the materials which appear to be endowed with persistent heat generating activity are complex silicates".

There follows a description of the preparation, in the wet way, of many complex silicates, and their preliminary testing for heat generation. A silicate of the protoxide of nickel and cobalt showed very large activity, larger than either silicate alone: and this now appears to be permanent. Nickel and cobalt are almost identical in atomic weight, and differ but one unit in atomic number. Quoting again from the 1927 paper:

"In the absence, at present, of other explanation, it is thought that persistent heat generation in some rocks and minerals is due to isotropic ether waves of great penetration; very great indeed, if the generation goes on in the interior of the sun and planets as it does at the surface of the earth". Quoting now from the 1928 paper (Ref. 6):

"It is now believed that the class of isotropic ether waves postulated as the cause of persistent generation of heat in some substances, is the same class, perhaps of very wide range of frequency, postulated as the cause of gravitation.

"Conversion into heat of some of the energy of the gravitation ether waves, however little, might be expected to impair to some extent the falling velocity of a heat generating substance; and all such substances thus far tested have clearly shown impairment.

"I have yet found no exception to this remarkable phenomenon, though I have already tested many natural and artificial minerals. Substances which have shown no generation of heat in the calorimeter show no impairment of their falling velocity when compared with lead. Substances exhibiting small, moderate or large generation of heat have shown comparatively small, moderate or large impairment of the gravitational acceleration.

"In making the above indicated comparisons of falling velocities I have largely used the method and apparatus described and illustrated in my 1923 paper on "Some New Experiments in Gravitation" (*Proc. Am. Phil. Soc.* LXII, No. 3; See also the 1924 paper of the same title: *Proc. Am. Phil. Soc*. LXIII, No. 1)

"Two aluminum containers are used, alike in size, shape, weight and smoothness of surface, and dropped simultaneously, side by side, through exactly the same distance (about 122 cm).

"Each container, at he end of its journey, breaks an electric circuit. But the breaks of both containers are in series in the same circuit, so that the break which occurs first produces a bright spark while the belated break gives no spark because its circuit is already open

"When the containers are equally loaded with the same metal, there is no visible spark at either break, or a very feeble spark at one or the other indifferently. But when they are equally loaded with certain different metals, one container persistently produces a bright spark, though containers are always reversed in position for each trial. From this it seems clear that the container giving the spark falls a little faster than the other. This sparking condition is clearly manifested when the faster container reaches the end of its free path as little as 0.0125 mm. ((0.0005 inch) in advance of its neighbor.

"The 1923 paper also describes how approximate quantitative measurements are made. These are very tedious, especially when falling velocity differences are large.

"To facilitate estimation of the larger falling velocity differences I am perfecting a photographic method of observation. After falling about 110 cm the small lower ends of the containers are photographed in silhouette against a white background having many horizontal lines, and illuminated by a very bright electric spark".

Then follows several pages of text, with figures and pates, describing the apparatus admits operation, too lengthy to quote here. Resuming quotation from last year's paper (1928):

"The camera lens is located about 37 cm in front of the white surface, and the photographic plate about an equal distance behind the lens; so that the image is about equal in size to parts photographed.

"The plate holder moves vertically in guides, and rests on a pin in one of eight equally spaced holes 1.6 cm apart in the backboard of the camera. This backboard has a horizontal opening 1.4 cm wide, which limits the exposed portion of the plate to a strip of this width. Thus eight pictures of the falling container tips are made on one plate. The containers are reversed in right and left position after each exposure.

"Plate III shows a series of photographs. Each container weighted approximately 30.6 grams. One was marked with a white spot on its top for identification. This one, lettered S on the plate, was filled with silicate of nickel and cobalt, which weighed 13.6 grams, or about 30.8 % of the total weight of the loaded container. The unmarked container was loaded with lead sawdust, held tightly in the lower end by a short closely fitting cork above it, until it very closely equaled the marked container in weight.

"Each of the eight photographs on the plate, when magnified, clearly shows the S container (Silicate) slower than its companion. Six more similar plates have been made with the same loaded containers, and all show the same effect. It will be noticed that the amount of retardation of the S container varies considerably in the eight exposures of Plate III. This was principally due to small lateral air currents in the room which acted unequally on the two containers when one shielded the other; as was demonstrated with another plate by purposefully increasing the lateral air currents. I shall eliminate lateral air currents in future work.

"Of course I tried exchange of loads in the containers, but without observably affecting the result; the container holding the silicate was always slow.

"The observed retardation o the silicate container must be due to impaired gravitational acceleration of the silicate as compared with the lead sawdust in the other container; and as the silicate constitutes only 30.8% of the total mass undergoing acceleration, we must multiply the observed retardation by 3.25 to find the full impairment of the silicate alone.

"In the apparatus as set up, the centers of the container tips are about 1.6 cm in front of the lined background; hence tips and lines cannot both be sharply in focus of the camera lens. In Plate III the focal plane of the camera was about half way between the tips and the lines. Sharpness of lowest part of the curve of the tips was greatly enhanced by permanently covering all of the camera lens except a horizontal strip 2 mm wide across its center.

"The comparison lines in Plate III are spaced one mm apart between centers. I am installing another white background with very much finer lines spaced only half a mm apart, and far better adapted to micrometer measurement of container tip differences of level.

"The Bureau of Standards, with a calorimeter of its own design, is working with some of the heat-generating substances for the purpose of checking my findings."

Since writing the 1928 paper I have continued work on the fascinating subject of "Correlation of continual generation of heat in some substances and impairment of their gravitational acceleration". These phenomena appear to be related as cause and effect. I have gathered considerable new evidence, all affirmative, so that I now feel justified in dismissing doubt.

In the quest for more evidence, however, I have reversed the order of procedure; i.e., instead of hunting more or less at random, for new substances exhibiting generation of heat in the calorimeters, which is a very slow and tedious process, I have first tested many new substances for impaired gravitational acceleration, which is comparatively rapid and easy. In these tests I have made more than 50 new plates, and feel well rewarded for the labor.

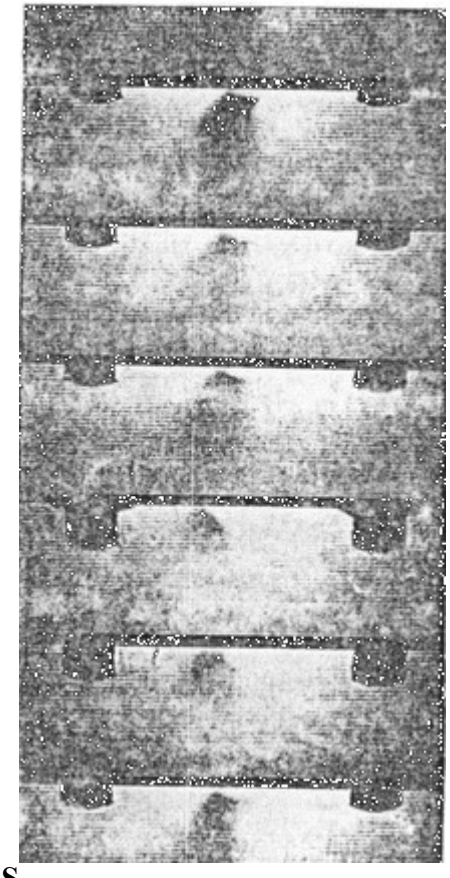
In my former experiments it had appeared that silicates of the iron group of metals exhibited much greater impairment of acceleration than silicates and compounds of the metals of lower atomic weight. So I chose silicates and other compounds of metals of still higher atomic weight, viz., Barium, Lead and Bismuth as most promising materials to work with.

In all the artificial silicates there was some sodium silicate. Lead silicate gave a moderate effect, but after ignition none. Bismuth silicate behaved in the same way. Lead acetate gave a moderate effect.

The barium compounds were found very interesting, and were more fully investigated. Barium hydroxide, $Ba(OH)_2$, $8H_2O$ gave rather large effect, but required lining of the container on account of its powerful corrosive action on metallic aluminum. BaO (anhydrous; effect moderate. BaO, $8H_2O$, effect small but certain. $BaCl_2$, $2H_2O$, effect small. $BaBr_2$, $2H_2O$, effect very small if any. $BaSO_4$; effect very moderate. $Ba_3(PO_4)_2$; effect small. $Ba(SCN)_2$, 2H2O; effect very small if any.

The Barium Aluminates were the most interesting of all the compounds examined. Three grades were prepared: $(BaO)_2Al_2O_3$, BaO, Al_2O_3 and $BaO(Al_2O_3)_2$. All, after air drying to constant weight, lost several % of hydroscopic moisture when dried at 100° C. and several more % of combined water when gently ignited. After ignition they were but very slightly hygroscopic. The BaO, Al_2O_3, dried at 100° C., gave largest effect; but after ignition the effect was somewhat reduced.

Plate I shows the impairment of gravitational acceleration in the BaO, Al_2O_3, not ignited, as compare with lead in the usual way. The upper two of the usual eight photographic strips are omitted, in order to permit enlargement of the remaining six strips about 50%. The black lines on the white background against which the lower tips of the two falling containers are photographed, are spaced exactly half a millimeter apart between centers, and are as fine as it was found practicable to make them. As before explained, neither the lines nor the tips of the rapidly falling containers are sharply in focus of the camera lens. The tip of the container holding the Barium Aluminate is marked S (slow) on the plate; and the containers were reversed in position after each dropping as indicated. As easily seen on the plate, the S container is unevenly slow in the six photographs, and even very slightly fast in the first. This unevenness is attributable to variation in the exceedingly slight friction of the containers in their guiding tubes during the first millimeter of their fall. The containers are perfectly free after that.



S

For accurate measurement of falling velocity differences of the containers in all plates, I have used a binocular microscope of low magnifying power, having a very large stage provided with a high-precision micrometer specially designed and built for this purpose.

In finding the average impairment of gravitational acceleration of the S container in the six photographs of Plate I, all were measured with the micrometer, the five affirmative values were added together, the slight negative value o the first one subtracted from the sum, and the remainder divided by six. This gave the mean slowness of the S container -- 0.099 mm, say one tenth of a millimeter. This is one part in 11,000 of the distance fallen (110 cm). But the Barium Aluminate constituted only 40.3 % of the total weight of the loaded container. Hence, impairment of falling velocity of the barium Aluminate alone, as compared with equal weight of lead in the other container, was one part in 4450. When a companion plate was made with the container loads exchanged (as customary in all tests), slowness of the Barium Aluminate was found closely the same.

Of the several compounds described and tested for impairment of falling velocity, only two have been tested in the ice calorimeter for continual generation of heat. Barium Sulphate, the first of these, was chosen because of its undoubted stability, although it had shown but very moderate impairment of falling velocity. It exhibited very moderate but steady and satisfactory generation of heat during a long run in the calorimeter. The second calorimeter test was made with barium Aluminate like that used for Plate I; but after preparation it was only air dried at room temperature, to avoid any unstability that might arise from hot air-drying, or ignition. The specimen was prepared about two months ago, and has been in the calorimeter during the last six

weeks, where it continues to show rather large and steady generation of heat. It appears to be quite stable.

More than a year ago the Bureau of Standards very kindly offered to repeat some of my experiments on "continued generation of heat in some substances". A special ice calorimeter, quite different from mine, was designed and built for the purpose. After much time spent in perfecting and calibrating the calorimeter, a specimen of the air-dried Sandusky clay describe din some of my earlier papers, was tested during the last few months; and I have very recently received official announcement that this substance does continually generate a measurable amount of heat. The Bureau is about to commence testing the comparatively active Nickel-Cobalt Silicate described in my last two papers.

Correlation of continual generation of heat in some substances and impairment of their gravitational acceleration, is regarded as very strong evidence in support of the kinetic theory of gravitation; and we seem now well on the way of finding out something definite about the nature of gravitation, which has been by far the greatest of all outstanding physical problems.

Bibliography

Dictionary of American Biography, Suppl. 1,2; p. 29

Science (March 10, 1911)

Nature 86 (2160): 130-132 (March 23, 1911); *ibid.*, 86 (2161) (March 30, 1911); Letter, Sir Oliver Lodge

Proc. Royal Soc. (Series A) 93 (1917); *ibid.*, 95 (with Sir Robert A. Hadfield & S.A> Main)

Proc. Amer. Philos. Soc. 50 (3), 1926; *ibid.*, 53 (213), Jan.-May, 1914; *ibid*., 54 (May-July, 1921; *ibid*., 60 (2): 43-61 (1921); *ibid.*, 62 (3): 75-89 (Sept. 29, 1923); *ibid*., 63 (1): 57-61 (1924); *ibid.*, 66 (3): 251-166 (1927); *ibid*., 67 (2): 105-117 (1928); *ibid*., 68: 55-68 (May 1929)

Amer. J. Sci. 88: 118-128 (Jan.-May 1914)

J. Franklin Inst. 206 (1232): 143-150 (Aug. 1928)

Phys. Rev. 9 (2), 1917

US Patents:
#337,299 (Battery)
#1,698,669 (Jan. 8, 1929), Piezo-electric crystals
1,823,864 (Sept., 1915)

Otis T. CARR UTRON

Introduction
Interview: "Long John" Nebel & Otis Carr, *et al.* (WOR Radio, NY, 1959)
***Information Bulletin* #3 (December 23, 1957)**
US Patent # 2,912,244: Amusement Device
OTC-X1 Model Construction Plans
Fate Magazine (May 1958): "Gravity Machine?"
Fate Magazine (August 1959): "The Saucer That Didn't Fly"

[Click Photo to View Large Image]

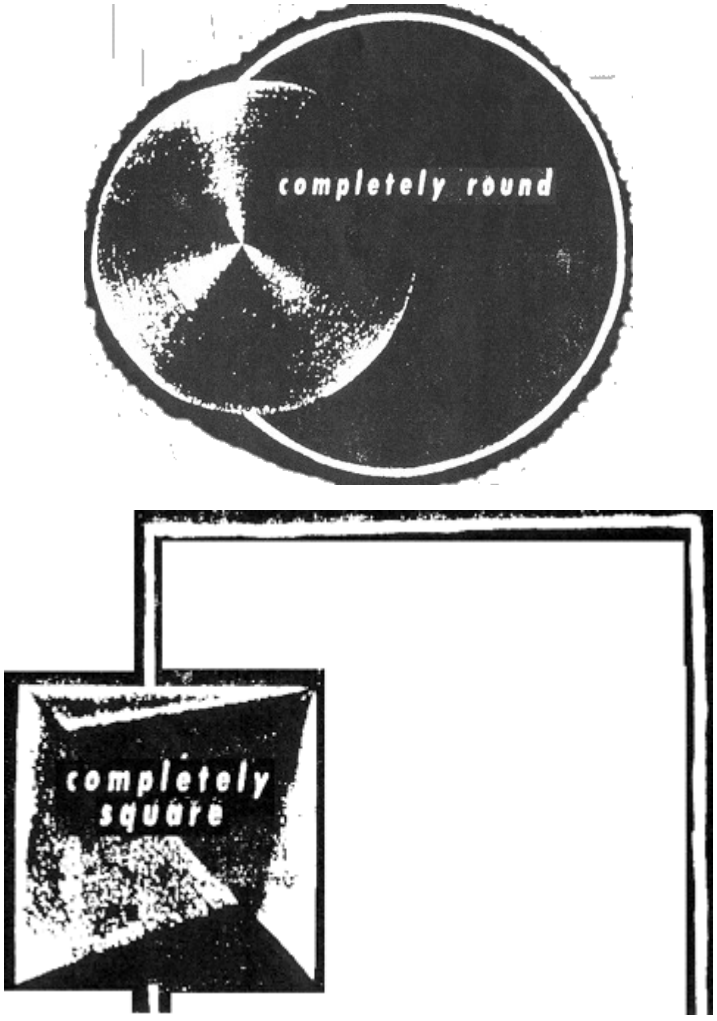
Introduction

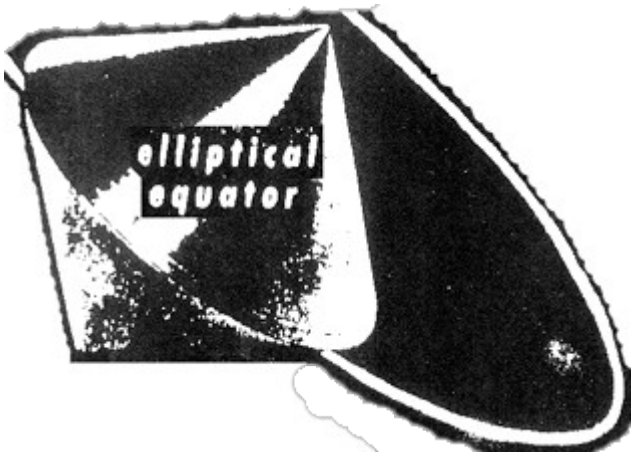
In the late 1950s, Otis Carr claimed to have discovered what he called the "Utron", a "molecular shell" that houses the atoms. The cohesion of molecular shells is brought about by inertial systems in the gravity field, manifesting in the two poles of natural magnetism and electromagnetism. He claimed that by "hatching" the atomic egg, particularly of paramagnetic and diamagnetic elements (especially bismuth), atomic energy could be released gently. The Carr affair is generally considered to be a fraud. This file is a collection of excerpts of technical factoids from articles, interviews, etc., on the subject, without consideration of Carr's botched attempts to make a business of it. The technology actually makes some sense (to me, anyhow, with qualifications and reservations). I was told by Ralph Ring (one of Carr's engineers) that he himself had flown in a short test flight of a small model of the craft. Carr's business methods (fraudulent stock offerings and amateurish publicity tainted with hubris and non-performance) doomed his efforts. His engineer Norman Colton was an alcoholic who stupidly threatened a local newspaper publisher, thus generating more negative feedback. It was a sad pass from Carr's earlier statement that "We shall not stop until we have penetrated our great discoveries into all the ends of the earth, or even as far into outer space as man desires to go!"

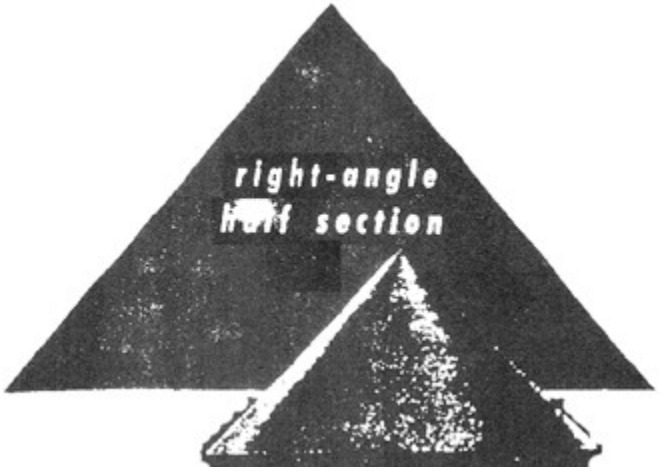
The historic details as published in various newspaper articles and particularly in *True, The Man's Magazine* ("King of the Non-Flying Saucers", January 1961), are too long to be transcribed here for any useful purpose. This file is composed only of technical factoids gleaned from the collection of papers offered by Rex Research (albeit as poor-quality photocopies, caveat emptor), plus a couple of short articles cribbed from Keelynet/Fate magazine.

According to Carr, "Any vehicle accelerated to an axis rotation relative to its attractive inertial mass, immediately becomes activated by free-space-energy and acts as an independent force... We have shown that a charged body, accelerated to an axis rotation relative to this attractive inertial mass, indicates polarity in a given direction. The dip-needle points, say, up toward the top of the body. But mount this while rotating body, with its spindle, on another platform and rotate this platform on a spindle, then if the counter-rotation is greater than the inertial forward rotation of the body, a dip-needle on the second platform will point down while the first dip-needle points up, indicating complete relativity of polarity. When the exact counter-rotation matches the forward rotation the body loses its polarity entirely and immediately becomes activated by free-energy (tensor stresses in space) and acts as an independent force... The above-described assembly of counter-rotating charged masses becomes weightless and will escape the immediate attraction of gravitational forces..."

The Utron







Interview: "Long John" Nebel (WOR Radio, NY) with Otis Carr, *et al.* (1959) ---

OTC (Otis T. Carr): "Our system utilizes gravity, electromagnetism, and electromotive force and a relative field to get its functional operation. We use an electrified sender. It's a sensor power core. Now this is what we call an accumulator... It is a storage cell, an accumulation of storage cells which provide an electromotive force in the same manner that any known battery produces and electromotive force...

This [the Utron] is a dimensional product. It was designed with the dimensions of space itself. We say it is truly the geometric form of space, because it is completely round and completely square. It has been proven in scientific laboratories that the very smallest unit of mass matter ever photographed in the electron microscope are square in shape... We have applied this principle into an electrified system, which is the power core of our space vehicle. Now what makes this unique and novel from a battery is the fact that this is a piece of moving machinery that rotates. Our average storage battery is an inanimate object set in an inertial spot and then the electromotive force is conducted by wires from this battery to animate some object.

LJ ["Long John" Nebel]: Let me interrupt for a moment; I'll try to describe it further. Well, it looks like two ice cream cones put together at the wide ends, but he angle is a lot wider [90 degrees] than that of the ice cream cones. There are a series of ridges; they look like gears would fit in. Is that correct?

OTC: No, those are in a sense turbine; they are reactive channels and where there is atmosphere a flow of air there aids in rotation.

LJ: Well, then, this is one of the components of the drive; this is the battery.

OTC: This is the center power core.

LJ: This generates electricity?

OTC: This is right. This is a storage cell for electrical energy. In operation it generates electricity at the same time it puts out electromotive force. This is the central power system for our spacecraft.

LJ: I can tell this: that it opened up and it appears to be hollowed out on the inside... it's circular, the inside; when the two parts are put one on top of the other and they fit into place, the cavity inside is circular...

OTC: It is a sphere, yes. And each unit is a hemisphere. We call the center of this large dimension the equator and of course it contracts and expands to a point on each side It's the union of two presto-conical sections; that is what it is Two right angle sections, and we say it is the dimensions of space and we have shown how this comes about...

LJ: In the literature you've provided us with, there's a mathematical formula that crops up here that intrigues me: minus zero divided by plus zero equals zero. Can you tell me more about it and how you stumbled on this idea?

OTC: The equation is brought about by the shape of our Utron electrical accumulator; this is the name given to our central power system. In our operation of working models and in checking out experiments, we had to find the formula that fir the reason for the action and reaction we were getting. So in exploring nature and studying the great inspirational work of the Dr. Einstein on relativity, we came upon this formula of linear correlation. And when we study linear correlation in geometric form we have to have a starting point and this is the point. And from there it explains through the cross and through the circle. And the only mathematical way we can express it is in the symbolism of zero X or 0X, and this formula brings us to that. We claim that this is the true unified field theory in physical practice.

In a further study of Dr Einstein's great inspirational work --- and we corresponded with him and we had the great good fortune of being advised by him at one time --- we learned that all measurements of time and space had to be considered in relationship to the observer and therefore there never was a fixed quantity of any number. Now in physical form, this is something else again...

On this craft, insofar as the individuals are concerned, we can travel in the same manner as a pressurized airliner. We don't have the problem of a heat shield... because the electromagnetic system sets up a protective shield in our craft which enables us to overcome this [thermal] barrier without any discomfort to the occupants of the craft. And we can very slowly rise, and once we are outside the atmosphere we can accelerate to tremendous velocities up to the speed of light itself.

LJ: How would it land, sir?

OTC: Very simply, we can fall at a very slow velocity of 100 feet/minute or less and we can set it down as gently as a feather because we have joined part of the operation of our craft to universal systems. This is a relative velocity craft and the minute it reaches the relative velocity of the attractive inertial mass, it becomes weightless as regards this inertial attraction.

Individually, it is not weightless; t has the same weight as before, but when it reaches the relative location it becomes an independent system just as a planet is an independent system.

LJ: Is there any gravitational pull at this point, sir?

OTC: None whatsoever. They will have the same feeling of pressure or weight that they have right now because we will maintain as far as possible the atmospheric pressure of the earth at sea level inside the craft.

LJ: I am under the impression that the only reason I'm able to sit in this chair is because of gravitational pull.

OTC: We have around 14 lb/square inch pressure within our atmosphere. We have been able to be sealed off away from such a condition and then artificially with atmospheric pressure the pressure in the cabin is maintained. We have it very well in submarines. The same may be used in our craft.

LJ: In other words, under sea where a submarine may be there is no gravitational pull; is that what you're saying?

OTC: There is gravitational pull at all times, but we are speaking about the atmosphere of the occupants inside a sealed unit.

LJ: Is that necessary to keep the occupants in the position they desire?

OTC: Absolutely, because in a vacuum they are at the mercy of any velocity.

LJ: What would happen, sir, if there were some kind of instrument that you could turn on and eliminate the gravitational pull that was in this room?

OTC: You would in a sense become very buoyant and this is not in itself a novelty but it certainly does not have any disastrous effect on humanity.

LJ: Would I remain in this position?

OTC: You could, but any movement would move you out of it.

LJ: Would objects remain in position?

OTC: Until they were brought into any movement. Any movement would make them buoyant themselves.

LJ: I have a lead pencil; if I hold it in the air and release my fingers it would fall because of gravitational pull. If we had this other condition which you so aptly described a moment ago, if I released my fingers would the pencil remain in midair?

OTC: This is true; it would stay there.

LJ: I believe what you're saying is that you'd be creating an artificial gravitational field within the body of the spacecraft and yet there would not be any gravity on the outside?

OTC: Exactly correct.

LJ: And this is done by the battery which I attempted to describe, spinning around and producing its own gravitational influence?

OTC: Yes, this is the beginning of an answer to your question: we have capacitor plates and electromagnets as a part of this system. Now, this is counter-rotating; the electromagnets rotate in one direction, and the batteries rotate in another. The capacitor plates rotate in conjunction with the battery so that we have a clockwise and counterclockwise rotation. Now the third system is the cabin that maintains the crew. This does not rotate; it is fixed due to the fact that

the two bodies are rotating clockwise and counterclockwise. Therefore the system causes the craft to escape from the gravity pull. The craft itself due to this system still has internal gravity because it still has the same weight that it had in the beginning.

LJ: What charges this battery?

OTC: This starts out electrochemically the same as other batteries, but we do have a regenerating system that is very unique. We are able here, for the first time to our knowledge, to use atmospheric electricity as a recharging system. This is done as part of the operational principle of the craft.

LJ: You say you use atmospheric electricity. What happens when you leave the atmosphere?

OTC: We have electrochemical systems to provide us with all the energy that we need and have a regenerating system in the manner of a regenerative coil that recharges this battery in the same manner that the storage battery in the automobile is recharged now, by a generator.

LJ: What you have doe is made the first perpetual motion machine.

OTC: There is nothing perpetual about our machine. The energies which cause it to operate are perpetual. You cannot destroy matter, and you cannot destroy energy; molecular flow is perpetual and that has been proven in the laboratory. It has been proven that electricity itself is immortal. When we take away resistance we can set up a spark of electricity and it will continue to operate; therefore we have perpetual energy. No machine that we can conceive of made by man would be perpetual, but it is free energy. It's self-energizing and as long as all parts function and do not wear out this is truly a self-energizing machine.

Ben: About this formula: were using conventional algebraic methods?

OTC: No, we weren't. Partially conventional, but we were joining actual space forms. We arrived at satisfactory equations for ourselves which can be demonstrated.

Ben: Are the physical laws upon which your invention works expressed in mathematical terms?

OTC: Possibly, but I wouldn't say that I'm qualified. We're satisfied with this formula.

Ben: Well, it's like saying plus 4 divided by minus 4 equals 4.

OTC: Sometimes these solutions are not always what appear. As we know in synergy, we know 1 plus 1 equals 3.

Ben: 1 plus 1 equals 3, when?

OTC: Because two conditions always produce a third.

Ben: the third condition is 2, isn't it?

OTC: Not necessarily.

Ben: Could you go over these conditions?

OTC: If one condition operates one way and another operates another way, when you join them you have another condition and their sum is 3.

Ben: Well, that is a little bit over my head. I've been looking at this prototype you have here and I notice a wooden frame or scaffolding you have a larger model of that you have on a turbine and around it is a wooden ring and it seems to be filled with electromagnets.

OTC: That's right; this is a wood model of an operational model. What we have here is the cones, our Utron electric accumulator; that is the power system. This system activates the electromagnets and in turn activates.

Ben: Does the system --- the thing inside --- activate the electromagnets on the outside?

OTC: This is true. We do this by contacting this lead wire from the positive and negative poles of these batteries to the electromagnets and then we have circuit breakers from these electromagnets and we have counter-rotation. These electromagnets will rotate counter-clockwise while the internal area is rotating clockwise.

Ben: Are these spools of wire on the model itself, are they magnetized also?

OTC: The coils of wire inside the ring are regenerative coils; they are electromotive force coils and they assist in regenerating the battery, because they are loops of wire brought through a magnetic field which sets up an electromotive force. These others are capacitor plates and these are also activated by the central power core, but these plates, which can accept a very high charge in neutral conductance also through the process of ionization utilize atmospheric electricity.

Ben: The fact that you have two cones meeting at their bases, so that you have something that is also square. I don't see how you get a square.

OTC: Dimensionally it is; it is square in these dimensions and when this rotation starts and builds up to a certain velocity, this form is very important because we have the total equation of action and reaction. Now this is done by a system of coil winding wherein we start at a point, expand to an equator, and continue our winding down to a point. With this physical expansion and contraction, is an electromagnetic field. Gravity enters the picture in the form of this relative rotation. When the relative rotation ---- inertial effective mass ---, it's a matter of dimension. So that is the earth, say, is 8,000 miles in diameter, we know its fixed rotation is 1 in 24 [blurred text, possible additional digit]. If we were 1 mile in diameter its rotation would be 8000 in 24 [blurred text, possible additional digit]. And by the same system, our 45-foot craft has a rotation of 580 rpm and when it reaches this rotation it is totally independent of its inertial attractive mass, in an electromagnetic field.

Ben: If your models get up to 580 rpm, will they take off?

OTC: This model was spun at 40,000 rpm and when it did it set a pressure pattern of 1,000 tons; the horsepower reading was a little over 700. Six engineers checked this out. Now the relative rotation of this model would be about 68,000 rpm, and when it reaches this rotation, it would immediately take off.

LJ: Would the time factor be involved with this craft?

OTC: In our solar system, the time factor would be involved, yes. We evaluate time on the velocity of light and in certain systems, if we exceed the velocity of light, unquestionably time would slow up.

Ben: Your craft can exceed the velocity of light?

OTC: We don't say this; I say I other systems.

Ben: I thought nothing could do this. I thought it was a constant factor, one of Einstein's factors.

OTC: Possibly in our system, but not necessarily true in other systems.

Ben: Anything approaching the sped of light becomes pure energy.

OTC: Pure energy, but in other systems it could change.

Ben: What other systems?

OTC: Other solar systems. We are completely controlled by our system and the velocity of light is our yardstick and our pattern and our craft is designed around this.

Ben: You don't just upset one of the basic principles of the universe.

Mel Salomey: Doesn't Einstein say any measurement is relative?

Ben: Except this one; it's the first axiom.

Mel: What is an axiom?

Ben: Self-evident truth.

Mel. Thank you. Wasn't Einstein theorizing; wasn't he assuming?

[Discussion of the speed of light, not included in transcript of the interview]

Roy: What are these coils? To describe this the best I can, imagine if you will a circle about 18 inches in diameter. Two circles that form a sort of a -- In other words, one circle fits over another circle and from the top of the circle and coming down from the other an inverted round pyramid. There are a number of what appear to be copper wound coils around the edge of it. And then there's a sort of a framework on top and underneath there's sort of braces. That's the general idea. I noticed these cones placed mouth to mouth with some coils, the coils on the edge of this thing; it revolves within this structure. A tough thing to describe.

Q: What is this over here, Mr Colton?

Colton: This is a paper mockup to show the counter-rotation principle and its outside section that Roy is describing looking at the other mockup. It contains the electrified horseshoe magnets. This would rotate in one direction counter-clockwise while the center section with the electron accumulator [Utron] would rotate clockwise in the other direction.

Q: Would these coils in the outer rim?

Colton: Rotate counter-clockwise -- It has a rotation speed relatively equal the earth's rotation speed, at about 580 rpm.

Q: When you say 580 rpm do you mean the outer rim is rotating on one direction 580 rpm and the inner rotating in the other direction at the same speed, giving a total rotation, one relative to the other, of 1160?

Colton: Exactly, although I don't know if 1160 has any bearing on it or not.

Q: Well, it would be twice the rotation in reference to the earth.

Colton: We're not giving it for a certain rotation for the sake of rotation but for the sake of relativity to the attractive mass. The earth at 8,000 miles diameter rotating once in 24 hours is relatively equal to a 45-foot craft rotating at 580 rpm, and 580 rpm would calculate to be the approximate rotational speed of an automobile tire on a car moving at about 25-30 mph.

LJ: Could a small craft be made to take off?

OTC: We plan to build a prototype model as a demonstration device. Now I would like to state that certain models have been built by me and tested. Each one has been airborne. One was lost entirely in space. We had a control system and this one didn't function. This has already been done.

Q: As was calculated, the speed of the circumference was 1263 mph. It gets kind of warm at that, doesn't it?

OTC: No, it won't because it has its own protection field which is its electromagnetic actuation. We described it as a self-contained unit. This ionization of the capacitor plates sets up a glow brilliantly with a very soft luminescent light.

LJ: What color?

OTC: It would be in the nature of blue-green or very similar to the electric arc you see in welding. This is the field we are testing. It does not have a heat barrier in forward velocity at all. This electromagnetic field is being tested out now in conventional aircraft and proved very efficient.

Q: Would you suppose you could put rockets toward the edges of the cone and have the thing spin by rocket propulsion?

OTC: We don't need it. We have a tremendous spin here. An electric motor operates the same way. You set up an electromotive force inside a magnetic field and you get rotation. So what we actually have here is an improved electrical motor which in itself is a circular device, and we say we make energy out of the air, from another dimension.

To clear your analogy up also, we would like to demonstrate the fact that this earth itself is literally a space craft demonstrating what we're talking about; it's rotating and orbiting at a certain constant speed with a magnetic field and it is in itself a spacecraft.

Q: Mr Colton, we assume the moon has a gravitational field. How does it make a gravitational field and yet it does not rotate on its axis.

Colton: It does not rotate on its axis?

Q: No, the moon does not rotate on its axis.

Ben: Sure it does, 1 rotation for 1 revolution.

Q: How long does it take?

Ben: 28 days.

Q: And the earth takes one day.

OTC: And that's how engineers and scientists have evaluated the velocity of the craft we call the earth by the orbit of it. Upon the pattern already set up, by the amount of time it takes the moon to rotate once around the earth from the center of the earth's core: 28 days. The distance being 245,000 miles. It is easy to calculate.

Q: These cones seem to revolve over intricately wound copper coils. Do you supply any motor power to this?

OTC: All energy comes from these two cones [Utron]. This in vernacular is a battery. The big novelty is that we have put a battery in motion. We have designed it within the accepted knowledge of total dimensions of space-matter and we have activated it electrochemically [electrolyte in the hollow center] and used the force through chemical activation to activate the entire craft, after which we have motion as the feature of this accumulator.

Ben: Mr Osgood's telegram brought up a very important and perhaps crucial point, mainly, James Clerk Maxwell demonstrated that light is an electromagnetic radiation, also verified by hertz who laid the foundation for modern radio. Now the speed of electromagnetic radiation such as radio waves also travels 186,000 miles per second. In other words, light and all forms of electromagnetic radiation travel at the speed of 186,000 miles per second. Now if it were possible for your craft to travel faster than the speed of light, it could, therefore, travel faster than

the speed of electromagnetic radiation. So once it exceeded 186,00 miles per second, you wouldn't be gaining all this energy from this electromagnetic radiation you're generating and wouldn't you fall rapidly down?

OTC: There is a continuous falling in space which in itself can bring velocity and can bring you to another system. We mentioned conjecturally that in other systems, there could be different velocities. We're not applying them to our craft. We don't identify them wit our craft. Relatively, we could not go faster than the speed of light unless we were in a system that permitted it. In our solar system, which we have mentioned now 3 times, it is designed on known principles. We conjectured about other systems. If we go beyond the speed of light in other systems the conditions within that system would make it possible for us to have power.

Roy: Let's assume, Mr Carr, this vehicle is at rest. What is it that originally overcomes the inertia of this rotor and starts the rotor moving?

OTC: The electromagnetic force stored in the energy of the Utron electric-accumulator, which in vernacular is a battery.

Roy: Now the Utron electric accumulator is these cones that are inverted to each other with bases together. I know of zinc batteries, nickel-cadmium, lead-acid cells. Could you use those?

OTC: We could use any of the kinds you mentioned; what we have here is tremendous power size in comparison to other batteries; therefore, it's very easy to put 1000 2-volt cells inside this one unit as you see it. It has functioned very well. In our 45-foot craft we plant to have 12,000-volt batteries which will extend an electromotive force which will energize the electromagnets and the capacitor plates. The generative coils will put back into the batteries in this system the same amount of volts going out until there is a breakdown of electro-chemicals or wear-out of equipment. But it could last as long as average storage batteries in automobiles.

Roy: In order to start the motor off originally, is it necessary to cause a flow of electricity through one set of the coils?

OTC: That's true.

Roy: Is there any magnetic force in the other set of coils at this point?

OTC: They individually operate by circuit breakers and the first motion begins to start a repetition. The same we have in a motor that has the opposite of a commutator, which is an accumulation of contact points where each coil is energized as the current flows through this coil. Then this starts the motion, the repetition of this motion brings the whole motor into phase in the same sense our accumulator and magnets become speeded up and the circuits are made and broken as they rotate.

Roy: Where the inner rotor rotates in one direction and the outer in the other direction. and if the cabin is located on top of the rotating mechanism, what keeps it from rotating in one direction or the other?

OTC: We have this cabin as the center of the craft and the battery below the cabin and the electromagnets are the total outside of the circular foil. The shaft of the accumulator goes through the cabin and there is a bearing. Now, just as this stays stationary when this is rotated, so will the cabin because there are two rotating forces. You have the clockwise rotation of the accumulator, the capacitor plates, the generative coils, you have a counter-rotation of the entire circular area of the craft, the larger diameter which houses the electromagnets; therefore, when you have rotation in both directions, the cabin itself is like a bearing and extension of the shaft. We've built models and proved this is correct.

Roy: OTC XI was accomplished?

OTC: Six crafts were airborne, one escaped; we used circuit breakers of various types and fuses burned through the switch and we lost one craft.

Roy: What was the size?

OTC: The largest and the one lost was 6 feet in diameter.

Roy: You also talk of the Caroto Gravity Motor and you mention it requires no fixed location in which to function, and you also say a lot of other wonderful things about the possibility for this motor. Is it something else than the spacecraft?

OTC: They are two separate packages. The spacecraft utilizes the electrical accumulator and the gravity motor uses the energy of the inertial attractive forces. We have learned how to take this energy and key it to a working shaft and get work power which we call free energy because it is. We don't make any part of it. Now in the rather vulgar vernacular sense this would have been classified as perpetual motion. It is nothing of the sort. It's free energy. Now we have learned that all masses that are smaller than the masses to which they are attracted exert energy. Even this ashtray; if it takes a pound of energy to lift it, then it is exerting a pound of energy. We have a true gravity motor. Its functional operation is to produce power continuously without any dissipation of the energy which causes it to operate, and we have built models of this and they operate and function and we are in the patent procedure with this.

Mel: Back to a question a while ago regarding an analogy of the earth as a spacecraft. Taking another look at the mock up prototype power package there in front of you. It resembles the solar system itself, and as a matter of fact one of the statements in the brochure published in 1957, stated it illustrated the geometry of the universe. It seems that this device miniaturizes and essentially duplicates the motion of bodies in the solar system. It must have the ability to miniaturize their energy. So in a sense, the bodies in the solar system, in all time, have maintained their constant motion perpetually in those motions and this is why people characterize this power package as a perpetual motion machine.

OTC: But we do not make any such claim.

Colton: The Utron has many applications, has many forms, many variation. In one sense you might describe it as an energized armature or in other words a motor with a self-contained moving battery, also capable of continuously re-energizing itself. The offer in regards to spacecraft applies to government and industry alike. We will only make total disclosure demonstration after we have procured a firm order. In other words, we're not looking for anyone to evaluate our development. Mr Carr has come a long way in his research. He doesn't need any risk money from taxpayers or industries for further exploration and development. We will disclose to anyone who is a purchaser, but not to anyone who comes along for curiosity.

Mel: What does the word "Utron" mean?

Colton: "Utron" is a coined word, a word Mr Carr put together: the letter "U" and "tron", U meaning the direction or shape of motion as applied and used and equated in this accumulator or battery we described -- U is the plane, the geometrical figure that is the portrait of the wave, you might say. The letter U as described on paper, the two-dimensional, is a portrait on paper of the wave or the wave motion with the cut field, with the straight line, the pressure energy in the Utron accelerator.

OTC: To me there's no such thing as a completed curve; you only go half way, just like you only go half way into the woods, then you're coming out. This is the same. A bisection of a total

sphere is its exact curve and one half of it is primarily U-shaped. Because in magnets there are always two poles and one normal way to show them is in a U-shape, but if it's in a bar magnet, there are still two poles and the shape is still the same. We can only put a rope one half way around the tree and it's coming back the other way, and this is true in all wave motion. Now, if you extend this into velocity, this is the pattern in the sine wave and definitely the electromagnetic wave.

Ben: I see... the vortexian of the wave

OTC: All motion is relative to all other motion, so this serpentine, spiral state.

Ben: So it's not the form of that motion, the graph and the equation. I'll accept the fact that it's the form of the utron motion though.

OTC: Also the form as well in two dimensions is intensified in the geometry of our accumulator.

Q: Why do you refer to this vehicle as a 4th dimensional vehicle?

OTC: Because the geometry of the accumulator is such as the 4th dimension. To me the application of space and time, a vibratory field and electricity as we know it is a vibratory force in motion. This is symbolic of it and when it is activated it becomes such. Now this may be a little bit difficult to understand, but nevertheless the very smallest electronic particles of matter have been shown under the highest type of electron microscope to be one-dimensional squares. To me this is verification that this is truly a space dimension because it is the shape of matter. Without matter you couldn't have space.

Q: I'm holding a thing that looks like two loudspeakers in a simplified form, placed mouth to mouth, two cones mouth to mouth, like two tops together so they have a point at each end and actually like a thickened flying saucer... Now what is it that comes from that: is it a high voltage?

OTC: The voltage is whatever we wish to make it by design.

Q: In other words, then, this is a battery?

OTC: That's right.

Q: The battery then goes through these magnets?

OTC: The battery rotates in this magnetic field. The average armature today in any electrical system is usually the permeability, iron wound with copper, then through a magnetic field acts as a motor, or it becomes a generator, depending upon the lead. The great novelty here in the area in which an armature is normally used, we have a [power unit, and this a battery, and this is a moving power unit.

Q: In other words, you might call this a self-contained power supply, right? How would this generator --- maybe I'm using the wrong word --- gather additional energy from outside?

OTC: This is due to its circular motion. Electrical forces are motions where they manifest. Now we have cycles in alternating current; AC gives you 60 cycles per second; we have discovered in our experiments that there is a space cycle related to electricity, and if we join the cycle we get energy from it.

Q: Mr Colton, will you try to describe to our listeners how they can draw at home a facsimile of an Utron?

Colton: You can take a pencil and draw four lines to form an open square. When you have a square, draw a straight line from one point of the square to an opposite point and you'll have two right angle triangles. Now if you convert the line you've just drawn into a small lip you'll begin

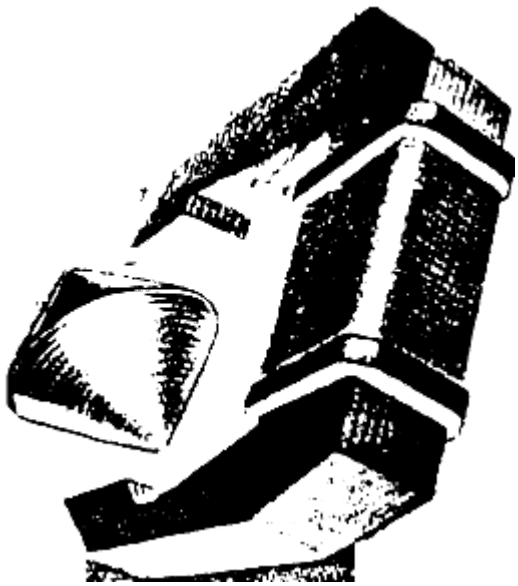
to see two inverted cones, the base of which form a circular equator. While you started with a square, you now have two cones. Obviously, the base of the cone is a circle or completely round as we describe it, and you have the device which is described as completely round and completely square, the Utron electric accumulator. The cavity in the center of these which is a hemisphere when the two cones are put together have a hollow sphere. This is the cavity which contains the electrolyte which would be used in some of the applications of the accumulator.

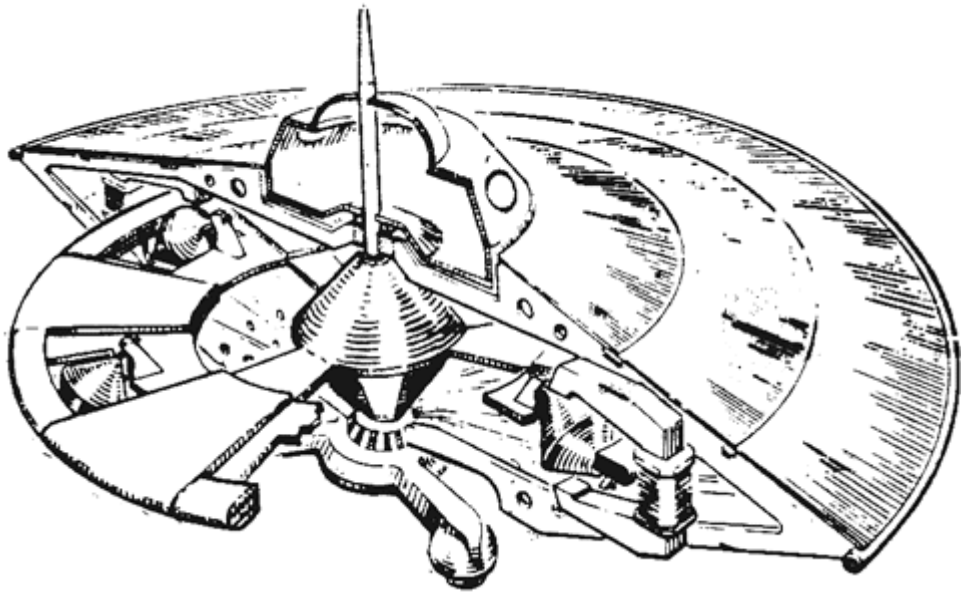
Q: Of what value is the term "completely round and completely square" apart from its obvious redundancy.

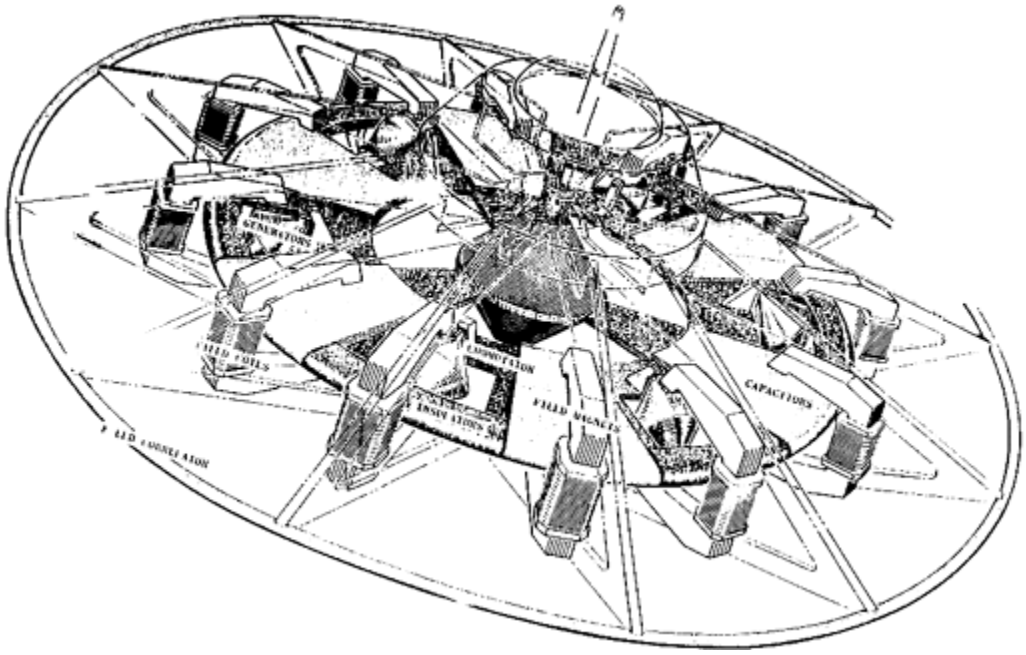
Colton: It is Carr's definition of the geometry or the basic space form or the basic form of all matter large or small relatively as we describe it. It is the definition of the terminal motions of universal energies in what we call space.

Q: In one of your brochures you make mention of a "photon gun" and you say, "This is primarily a development that works outside of the earth's atmosphere. We are entering an age of space flight and the use of solar energy is practically unlimited"... What is a photon gun?

OTC: I am using the word gun as a reaction principal instead of as a weapon, nevertheless it is a gun and in fact fires billions of rays of solar energy at right angles to the reception. By placing them through a certain chamber, we have been able to get a reaction and whenever there is a reaction, we can get power, we can get force from it. So we feel outside the earth's atmosphere new systems of propulsion even beyond our own of electromagnetism will make themselves apparent.







***Information Bulletin* #3 (December 23, 1957) [Excerpts]**

"Carr's Principles of Free Energy Space Flight Accorded Highest Scientific Verification"

Otis T. Carr, President of OTC Enterprises in Baltimore and inventor of a manmade spacecraft, which he has offered to build and deliver to the government without one penny of risk to the

American taxpayer, publicly revealed the propulsion principle of his spacecraft in the following statement:

"Any vehicle accelerated to an axis rotation relative to its attractive inertial mass, immediately becomes activated by free-space-energy and acts as an independent force..."

An excellent example of this principle applied in practice is the fact that the two satellites now orbiting the earth, have achieved space-energy activation by an equivalent inertial velocity, and were it not for their susceptibility to internal or inherent physical deterioration, they would theoretically and factually be kept orbiting by natural space forces until the end of time in our solar system. These statements in evaluation of natural physical phenomena as first discerned and made public by Mr Carr, have been physically tested in laboratory experiment by an impartial scientific laboratory and confirmed as follows:

"We have shown that a charged body, accelerated to an axis rotation relative to this attractive inertial mass, indicates polarity in a given direction. The dip-needle points, say, up toward the top of the body. But mount this while rotating body, with its spindle, on another platform and rotate this platform on a spindle, then if the counter-rotation is greater than the inertial forward rotation of the body, a dip-needle on the second platform will point down while the first dip-needle points up, indicating complete relativity of polarity. When the exact counter-rotation matches the forward rotation the body loses its polarity entirely and immediately becomes activated by free-energy (tensor stresses in space) and acts as an independent force... The above-described assembly of counter-rotating charged masses becomes weightless and will escape the immediate attraction of gravitational forces.

"Your discovery therefore is distinctly a possibility, and its creative genius lies in its inventor's ability to provide it with a process for generating its own power as a result of its self-rotation."

Translated into familiar terms, this scientific explanation means that the above-described assembly of counter-rotating charged masses becomes weightless and will escape the immediately attractive gravitational forces...

Our experiments and investigations have made known to us that the mighty power from the Sun can be utilized when the geometry of design is properly evaluated. We are aware of the resistance factors involved, due to the earth's atmosphere, and our developments have been predicated on overcoming these, which in some instances has been done.

We have invented a Fourth Dimensional Vehicle. This Fourth Dimensional Vehicle is powered by the revolutionary Utron electric accumulator, which is completely round and completely square, and generates its own power, which is electromagnetism and electromotive force. It can be launched form the earth, and does not have to be blasted into space. The basic design was brought to the attention of the United States Government, and a patent application was filed in 1949.

Some tests were independently made by qualified engineers at one of America's leading plants and it was estimated that a small model, only 4 inches in diameter, produced energy equivalent to 1,000 tons. This was in 1952, and Mr Carr was unable to interest anyone in his efforts at that time. Things have changed, and the Government has now put its blessing on space flight development.

At the present time the rocket enthusiasts are commanding topmost attention. But there will be changes in thinking, and new directions of endeavor very soon. Our experiments with circular-foil design, as relates to gravity, electromagnetism, and electromotive force, have led us to the certain conclusion that it is possible to use the inverse-proportion laws of Newton as successfully

as the third law of motion applies to accelerated rockets. We will produce the OTC-X1 circular-foil spacecraft as the first operational prototype as symbolized in this conception drawing.

Claims Christ Disclosed True Nature of the Universe in Symbolism of the Cross ~

Visionary Mr Carr claims that Christ disclosed the true nature of the Universe in the Symbolism of the Cross. He pointed out that "Christ is truly expressed in the sign of the Cross -- the true Cross -- the absolute, the finite expression of the cosmos that we call the Universe". The inventor further stated:

"A universe has only two basic properties: the motions and the directions. The correlation of these properties manifest in several forms, their two categories being called energy and matter.

"These two forms are equal to each other, and are the product of each other, matter being energy under the pressure of motion and having relative finity because of the harmonious correlation of the direction of such pressure, and energy being matter released from pressure by any change in the direction of motion.

"In any universal system, these motions and directions manifest their finite totality in what we call space, and describe their total form in what we call straight lines and curves, the geometry of which is expressed in a finite form whose dimensions are a constant correlation of the directions and motions. We have equated the shape of this universal space and translated it into physical form which we have called the Utron Electrical Accumulator, which expresses the linear correlation of space motions and directions in a form that is therefore completely round and completely square.

"In its linear proportions the Utron Electrical Accumulator is the union of straight lines brought together in and from all directions, and in its correlation of and with curved lines it expands from a point to the circumference of its equator and contracts from that equator to a point, always being a correlation of complete curves. The aim of these linear correlative dimensions is three points, the exact center point of which is +0 and -0, the exact peripheral points of which are +X and -X.

The space ship designer then mathematically points out his theory:

-0 / +0 = 0

-X / +X = X

0 + X = 0X

Continued Mr Carr:

"We were inspired to complete this work in the service of the Christ Jesus by Albert Einstein's search for a unified field. This relativity is a unified field, expressed in physical form is the square in the circle bisected by the Cross. The Utron Electrical Accumulator is the full expression of the dot that was the beginning of 0X, extended in all directions to form the cross, which in motion continues on to form the square and the circle.

"In the beginning was the Word. The Word was 0X [actually: AeTZI], and in the revelation of Jesus, was given for all who wanted to see, in the symbolism of the true cross.

"Set the cross in motion and you will see the halo that is Light and which we also call Energy.

"If there is not time
And there is no space
There can be no other place.
And perhaps there is no far.

Perhaps the Universe
Is right where we are."

Peace and plenty through the Application of Free Energy to Supply All Things to All People.

US Patent # 2,912,244

Amusement Device

(November 10, 1959)

Otis T. Carr

This invention relates generally to implements in amusement devices, and more particularly to an improved amusement device of the type where the passengers will receive the impression of riding in an interplanetary spacecraft.

The present invention contemplates a novel amusement device having the overall configuration of a spacecraft and being formed in various sections, with portions of the sections being rotated in opposite directions to give the impression of movement to the passengers. It is also contemplated to move the craft up and down and display an animated movie of heavenly bodies above the passengers to give the passengers an impression of leaving the earth and approaching a distant planet or the like. This invention further contemplates the provision of electromagnets, cones, and the like carried by the oppositely rotating sections of the device, and windows through which the passengers may view these simulated objects to give the impression that they are viewing the inner workings of an interplanetary spacecraft during flight of the craft. Finally, this invention contemplates the construction of the various portions of an amusement device simulating an interplanetary spacecraft in such a manner that the device may be easily transported in sections from one location to another and reassembled in a minimum of time.

An important object of this invention is to provide an amusement device wherein a passenger in the device receives an impression of flying in an interplanetary spacecraft.

Another object of this invention is to provide an amusement device having a general configuration of an interplanetary spacecraft and having oppositely rotating sections simulating the movement of various portions of the device to impress the passengers with flight in a spacecraft.

Another object of this invention is to provide an amusement device simulating an interplanetary spacecraft wherein the passengers will be physically moved a very minor distance and yet will receive the impression of flying in a spacecraft.

A further object of this invention is to provide a portable amusement device simulating an interplanetary spacecraft which may be easily disassembled and transported from one location to another.

A still further object of this invention is to provide an amusement device which is simple in construction, may be economically manufactured, and which will have a long service life.

Other objects and advantages of the invention will be evident from the following detailed description, when read in conjunction with the accompanying drawings which illustrate my invention.

In the drawings:

Figure 1 is an elevational view of an amusement device constructed in accordance with this invention.

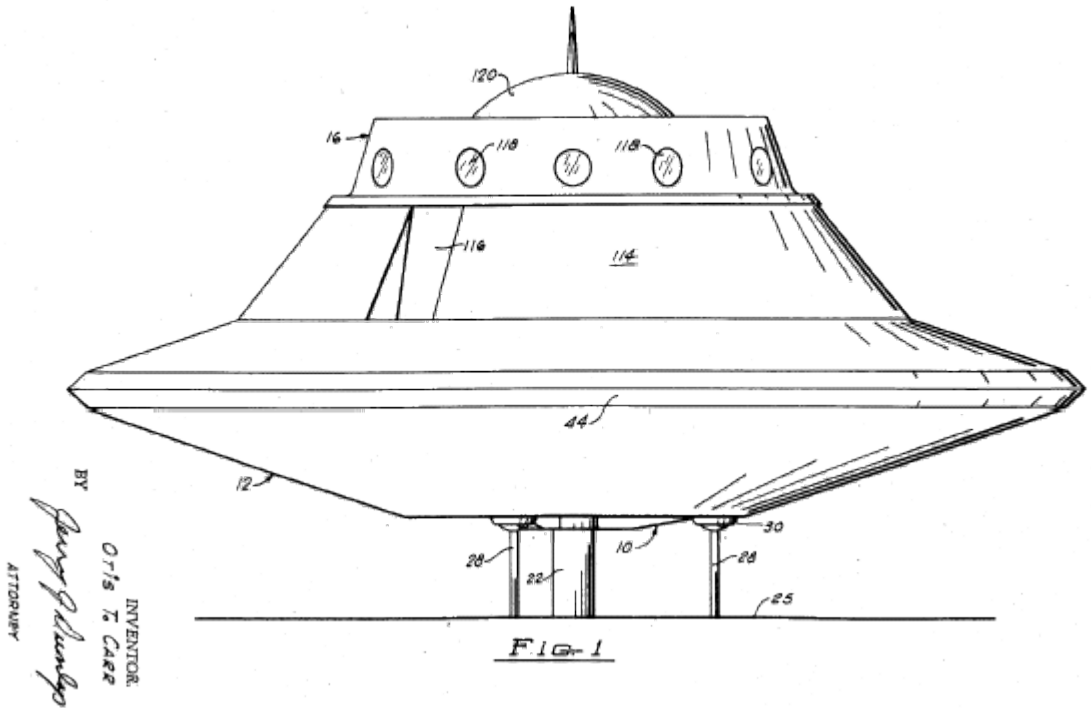


Fig. 1

Figure 2 is a vertical sectional view through the device illustrated in Figure 1.

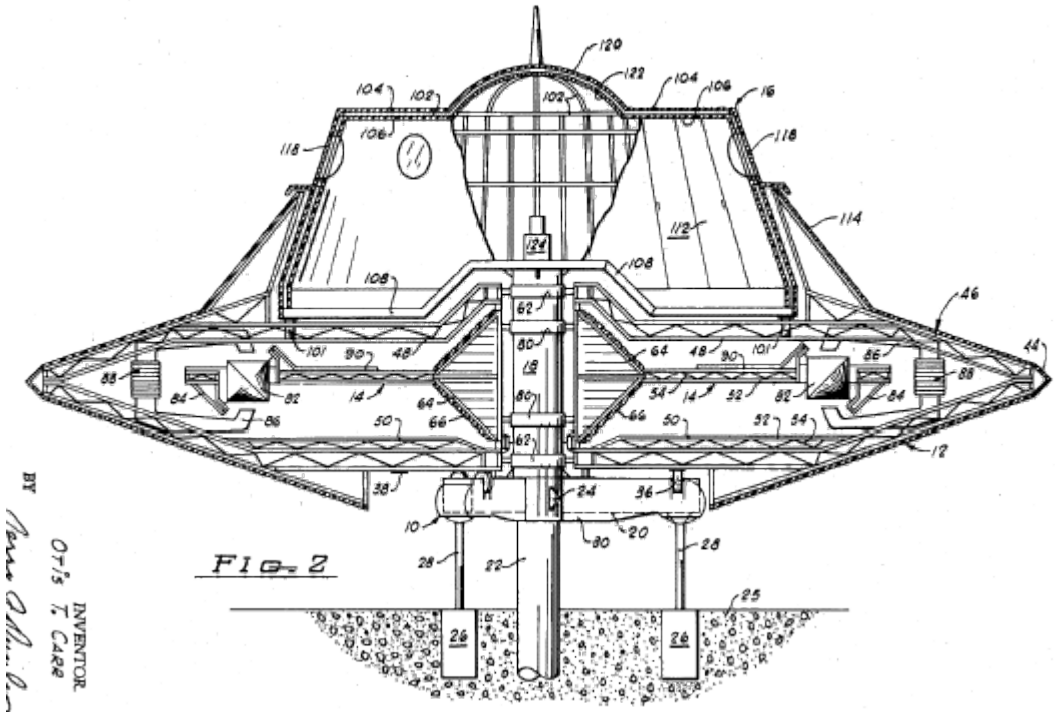


Fig. 2

Figure 3 is a plan view of the landing gear for the amusement device, with the housing around the legs of the landing gear removed.

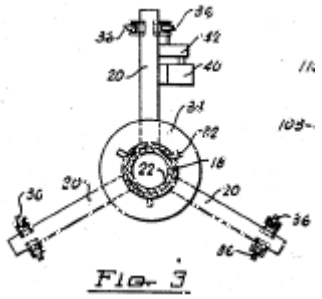


Fig. 3

Figure 4 is a plan view of the supporting structure or framework for the outer rotating shell of the amusement device shown in Figures 1 and 2.

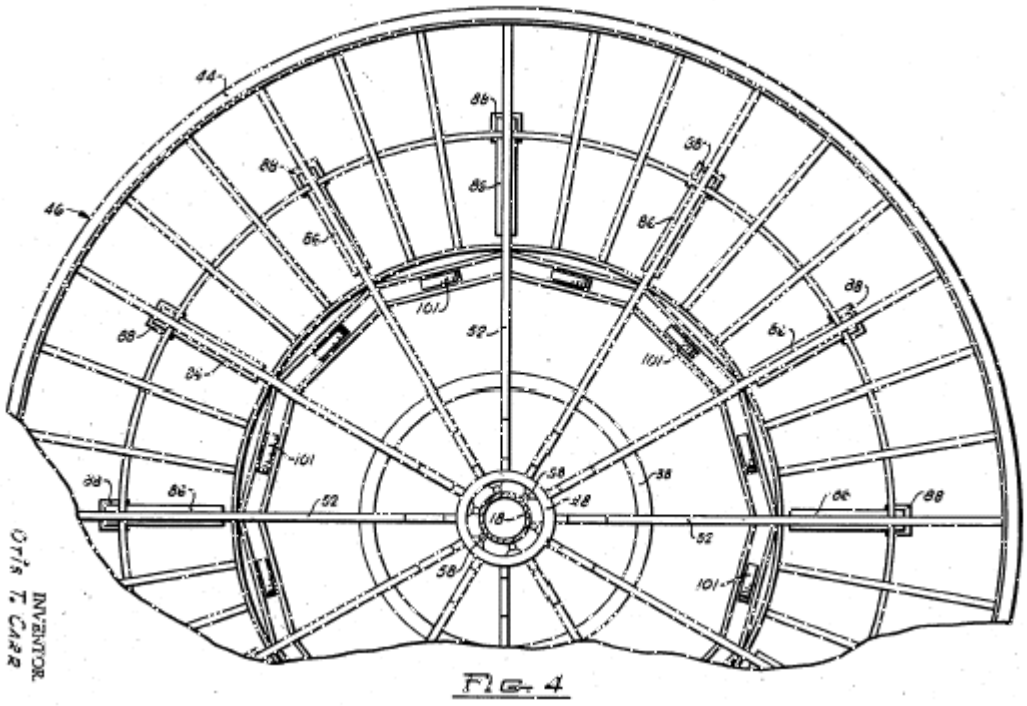


Fig. 4

Figure 5 is a plan view of the central rotating assembly which rotates within the outer shell frame illustrated in Figures 2 and 4.

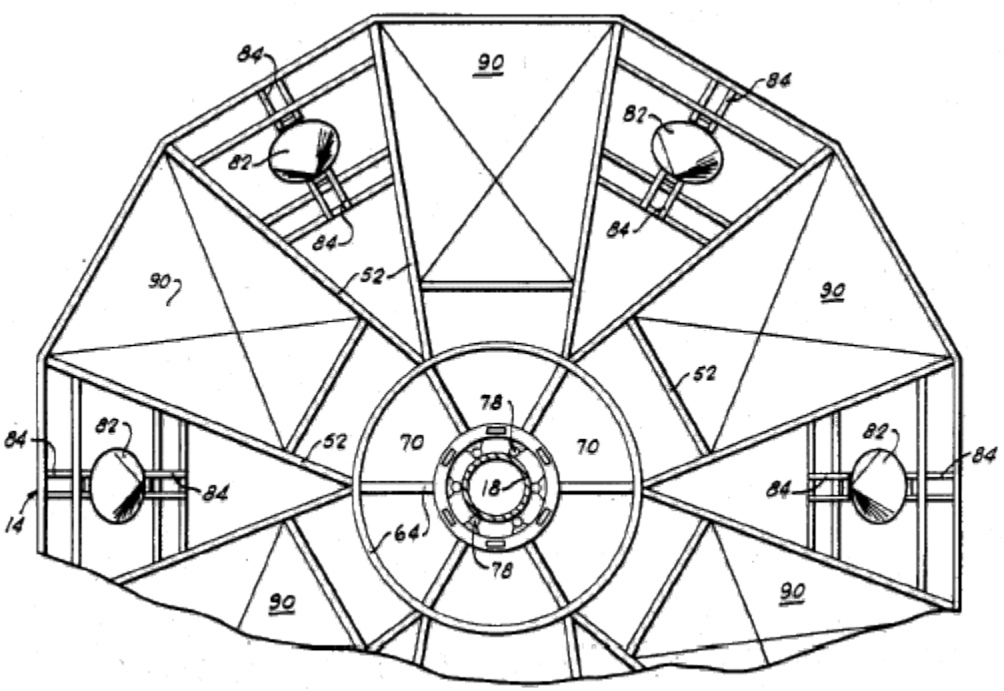


Fig. 5

Figure 6 is an enlarged sectional view illustrating the support and the drive between the inner rotating assembly and the outer rotating assembly.

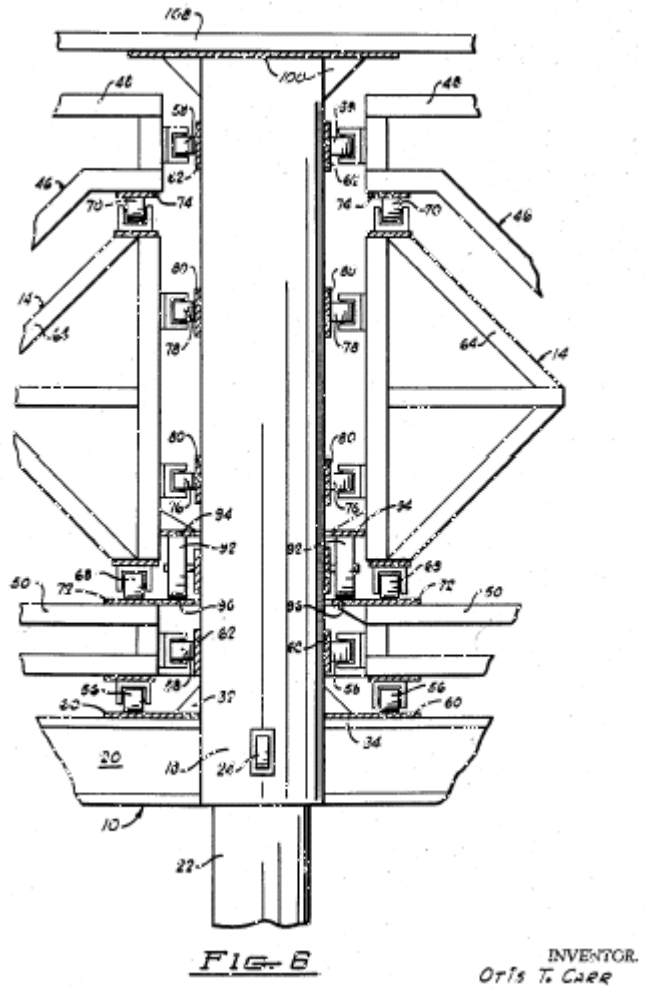
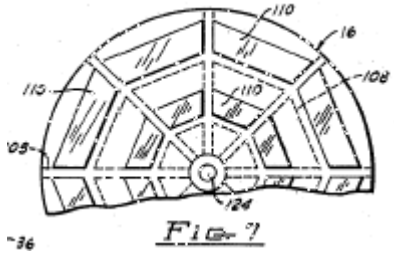


Figure 7 is a plan view of the floor portion of the passenger cabin.



Referring to the drawings in detail, and particularly Figures 1 and 2, a preferred embodiment of the present invention comprises, generally speaking, a supporting structure and landing gear 10, an outer rotating shell 12, an inner rotating assembly 14 (shown only in Figure 2) and a passenger cabin 16 extending downwardly into the upper end portion of the outer shell 12. The landing gear and supporting mechanism 20 comprises a vertically extending tubular member 18 around which the outer shell 12 and inner rotating assembly 14 are journaled as will be hereinafter set forth, and a plurality of legs 20 extending radially outward in circumferentially spaced relation from the lower end of the tubular member 18. The tubular member 18 is telescoped over a supporting stanchion 22 which may be in the form of a pipe, and the tubular

member 18 is slidingly supported on the stanchion 22 by suitable wheels or rollers 24 to facilitate vertical movement of the member 18 on the stanchion 22, as will be hereinafter set forth. The stanchion 22 is preferably supported in a suitable foundation 25 to provide adequate strength for the amusement device.

A suitable jack 26, preferably a hydraulic jack, is anchored in the foundation 23 underneath the outer end portion of each of the landing gear legs 20 and is provided with an extension 28 extending upwardly into connection with the respective leg 20. The jacks 26 are operated simultaneously to raise and lower the landing gear and supporting structure 10, as will be described. A suitable shaped housing 20 is preferably secured around each of the landing gear legs 20 to provide a streamlined appearance. It may be noted that each of the legs 20 is preferably constructed out of a structurally strong member, such as an I-beam, and is secured to the lower end potions of the tubular member 18 by suitable braces 32 and plates 34 to assure a rigid and adequate connection of the legs to the tubular member 18.

A pair of rollers 36 (see also Figure 3) are rotatably supported adjacent the outer end portion of each leg 20 of the landing gear and are arranged to engage a circular track 38 (Figures 2 and 4) for partially supporting the outer shell 12 and the inner rotating assembly 14 as will be described. Also, a suitable drive motor 40 (Figure 3) is mounted on one of the legs 20 of the landing gear and is connected through a suitable gear box 42 to one of the rollers 36 to rotate the outer shell 12 with respect to the landing gear and the supporting structure 10. The roller 36 connected to the drive motor 40 may be suitably chained (not shown) to its companion roller 36 to assure an adequate drive connection between the drive motor and the circular track 38.

The shell (Figure 2) is tubular in configuration, with the diameter of the central portion thereof substantially larger than the diameter at the opposite ends thereof, and is supported in an upright position to give the general appearance of two saucers placed face-to-face. The outer edge portion 44 of the shell 12 is preferably formed of partially transparent material, such as Plexiglass, and is illuminated from within (not shown) to provide a band of light around the central portion of the shell 12. the remainder of the shell 12 is formed of any desired opaque and relatively strong material, such as aluminum-laminated masonite sheets.

The shell 12 is supported on a frame generally designated by reference character 46 and illustrated in Figures 2 and 4. the frame 46 is circular in plan, as viewed in Figure 4, and is substantially U-shaped in cross-section (as shown in Figure 2) to provide an upper horizontally extending portion 48 and a lower horizontally extending portion 50 which extend from adjacent the support member 18 outwardly to the central portion of the shell 12. The frame 46 may be easily formed with industrial steel tubing 52 formed into a truss with bracing of steel rods 54. With this construction, the frame 46 may be easily fabricated in sections for convenient assembly, or the entire frame 46 may be lifted off of the supporting member 18 and transported to another location.

Support of the frame 46 and the outer shell 12 is provided by the track 38 (previously mentioned) which is secured on the lower face of the lower horizontally extending portion 50 of th3 frame 46 in a position to engage the roller 36 carried by the landing gear legs 20. Additional support for the frame 46 is provided by rollers 56 (Figure 6) secured around the inner edge of the lower portion 50 of the frame, and rollers 58 secured around the inner periphery of both portions 48 and 50 of the frame. The rollers 56 are arranged in circumferentially spaced relation around the inner periphery of the frame 46 and engage a circular track 60 supported by the legs 20 of the landing gear. The track 60 may be an extension of the upper plate 34 shown in Figure 3. The rollers 58 engage tracks 62 extending circumferentially around the supporting member 18 to

accommodate any radial forces imposed on the frame 46. It will be understood that any desired number of the rollers or wheels 36 operated by the motor 40 will engage the track 38 to rotate the shell 12 in one direction around the longitudinal axis of the supporting member 18. The rollers 56 will engage the track 60, and the rollers 58 will engage the tracks 62 during such rotation of the outer shell 12 and frame 46.

The inner rotating assembly 14 is generally annular-shaped, as illustrated in Figure 5, for movement around the supporting member 18 between the upper and lower horizontally extending portions 48 and 50 of the frame 46. The assembly 14 is also preferably constructed as a frame out of square steel tubing 52 formed into a truss with steel rods 54 for bracing, and is provided with a double conically-shaped framework 64 adjacent the supporting member 18. The framework 64 is provided to support a covering material 66 of any suitable type such as laminated metal or plastic, to simulate a solid member in the central portion of the amusement device, which in turn simulates a portion of a spacecraft, such as the power unit for the craft. The covering material 66 may be corrugated if desired. The framework 64, as illustrated in Figure 6, is also provided to support the rotating assembly 14 on the supporting member 18 and the frame 46. A plurality of rollers 68 are provided around the lower face of the framework 64, and a plurality of rollers 70 are provided around the upper face of the framework 64 to engage circular tracks 72 and 74, respectively, which are mounted on the frame 46. The rollers in each set of rollers 68 and 70 are provided in circumferentially spaced relation around the inner periphery of the rotating assembly 14 to accommodate vertical thrusts imposed on the rotating assembly. Additional rollers 76 and 78 are provided around the inner periphery of the framework 64 to engage tracks 80 extending circumferentially around the supporting member 18 to accommodate radial thrusts imposed on the central rotating assembly 14. It will be apparent that any desired number of rollers 76 and 78 may be provided around the inner periphery of the framework 64 to adequately support the rotating assembly 14.

I also prefer to support a plurality of conically-shaped member 82 in the outer edge portion of the central rotating assembly 14. Each conically-shaped member 82 may be easily formed out of a suitable sheet material, such as aluminum or plastic, and is supported at its opposite ends by suitable trunions 84 to extend through the truss comprising the frame of the central rotating assembly 14. The conically-shaped members 82 are preferably provided in circumferentially spaced relation around the assembly 14, as illustrated in Figure 5, and are positioned to move through simulated electromagnets 86 supported around the frame 46, as illustrated in Figures 2 and 4. Each simulated electromagnet 86 may be formed in horseshoe shape out of any suitable sheet material, and is provided with tubing or the like 88 around a portion thereof to simulate the winding of an electromagnet. I further prefer to secure a plurality of plates 90 in spaced relation 14 to simulate capacitor plates in a spacecraft. The plates 90 may be formed out of any suitable material such as aluminum-laminated masonite to provide a striking appearance.

The inner rotating assembly 14 is driven by a friction or dead wheel 92 pivotally supported on the tubular member 18, as illustrated in Figure 6, engaging circular plate 94 and 96 carried by the inner rotating assembly 14 and the frame 46, respectively. The plates 94 and 96 are arranged in vertically spaced relation with sufficient distance therebetween to frictionally engage opposite portions of the wheel 92. It will therefore be apparent that when the frame 46 is turned in one direction, the plate 96 will engage the periphery of the wheel 92 to drive the wheel 92 and in turn drive the central rotating assembly in the opposite direction by frictional engagement of the wheel 92 with the plate 94. Therefore, the various conically-shaped members 82 will be moved successively through the simulated electromagnets 86 and give the appearance of the generation of electrical energy.

The cabin 16 is supported on the upper end of the tubular supporting member 18 and is rigidly secured to the member 18 by bracing 100 to move with the supporting member 18 and to be prevented from rotating with the shell 12 or rotating assembly 14. Additional support is provided by a plurality of rollers 101 carried by the frame 46 engaging a complementary track on the bottom of the cabin. The cabin 6 is constructed out of a suitable framework 102 such as aluminum laminated with masonite, on the outer surface of the framework and any other suitable material 106, such as masonite, around the inner surface of the framework. It will be understood that substantially strong members 108 must be provided in the floor of the cabin 16 to adequately support passengers in the cabin. As illustrated in Figure 7, a plurality of transparent windows 110 are provided adjacent the outer and inner peripheries of the floor of the cabin 16, through which the passengers in the cabin may adequately view the inner rotating assembly 14 and the frame 46.

Passengers may either stand or sit in the cabin 16 and may gain entrance and exit from the cabin through suitable doors 112 as illustrated in Figure 2. It will also be noted that the upper edge portion 114 of the outer shell 12 is extended upwardly to overlap the lower end portion of the cabin 16. A portion of the upper edge 114 of the shell 12 is removed, as at 116 in Figure 1, such that passengers may enter the cabin 16 through the doors 112. Simulated portholes 118 are provided around the upper edge portion of the cabin 16 to further simulate an interplanetary spacecraft. It will be noted, however, that the portholes 118 are preferably covered with an opaque material on the inside of the cabin 16 to prevent the passengers from seeing familiar objects outside the cabin 16.

A dome 120 is preferably provided in the top central portion of the cabin 16 and the under surface thereof is covered with a suitable material 122, such as cloth or the like, which will display a movie scene. A projector 124 is suitably mounted in the central portion of the cabin 16 to project an animated movie onto the screen 122 during the operation of the amusement device to give passengers the impression of interplanetary flight.

In summarizing the operation of the referred amusement device, the passengers are directed into the cabin 16 through the opening 116 in the upper edge portion of the shell 12 and through the doors 112. The doors 112 are then securely fastened in close depositions and the passengers are thereafter prevented from viewing any object outside the amusement device during the simulated flight. The drive motor 40 is then placed in operation to rotate the shell 12 and frame 46 in one direction, while the friction wheel 92 drives the inner rotating assembly 14 in an opposite direction. Passenger sin the cabin 16 will then view the movement of the inner assembly 124 and the frame 46 through the windows 110 to receive the impression of watching the inner workings of a spacecraft. Also, suitable lighting effects (not shown) are preferably provided in the sell 12 to illuminate the moving parts. Simultaneously with rotation of the shell 12 and the inner rotating assembly 14, the jacks 26 are actuated to raise the supporting member 18 on the stanchion 22. This upward movement of the supporting member 18 will be rather minor, but will be sufficient to give the sensation of rising to the passengers in the closed cabin 16. It will be observed that when the supporting member 18 is raised, the shell 12 and the inner rotating assembly 14 are simultaneously raised to retain the vertical relationship between the cabin and the remainder of the apparatus viewed by passengers in the cabin. Also, simultaneously with rotation of the shell 12 and rotating assembly 14, the movie is displayed by the projector 124 on screen 122 on the dome of the cabin to give the passengers the impression of approaching one or more heavenly bodies. The jacks 26 are then operated in the opposite direction to lower the cabin 16 and the movie projected by the projector 124 may then provide an impression on the screen 122 that the passengers are returning to earth.

From the foregoing it will be apparent that the present invention provides an amusement device which will give the impression and sensation to patrons or passengers of the device that they are taking an interplanetary flight. The device includes counter-rotating sections simulating the inner workings of a spacecraft and these moving sections may be easily viewed by passengers in the device. Also, the passengers are slightly raised during operation of the device to simulate flight from the earth and a movie is simultaneously displayed to give the impression of approaching a heavenly body. It will also be apparent that the construction of the amusement device is such that the device may be easily disassembled and moved from one location to another. It will further be apparent that the present amusement device is simple in construction, may be economically manufactured and will have a long service life.

Changes may be made in the combination and arrangement of parts or elements as heretofore set forth in the specification and shown in the drawings, it being understood that changes may be made in the embodiment disclosed without departing from the spirit and scope of the invention as defined in the following claims.

I claim: --- [Claims not included here]

Model OTC-X1 Construction Plans

As your eyes take in the shapes and relationships in these illustrations of the miniature model you are about to build, your reasoning will let you understand much about the invisible forces that contribute to the noise-free, pressure-free, and vibrationless sensation of floating flight to be experienced in the passenger living rooms aboard the OTC-X1. It will be very much like reclining in an overstuffed armchair on our comfortable old planet Earth.

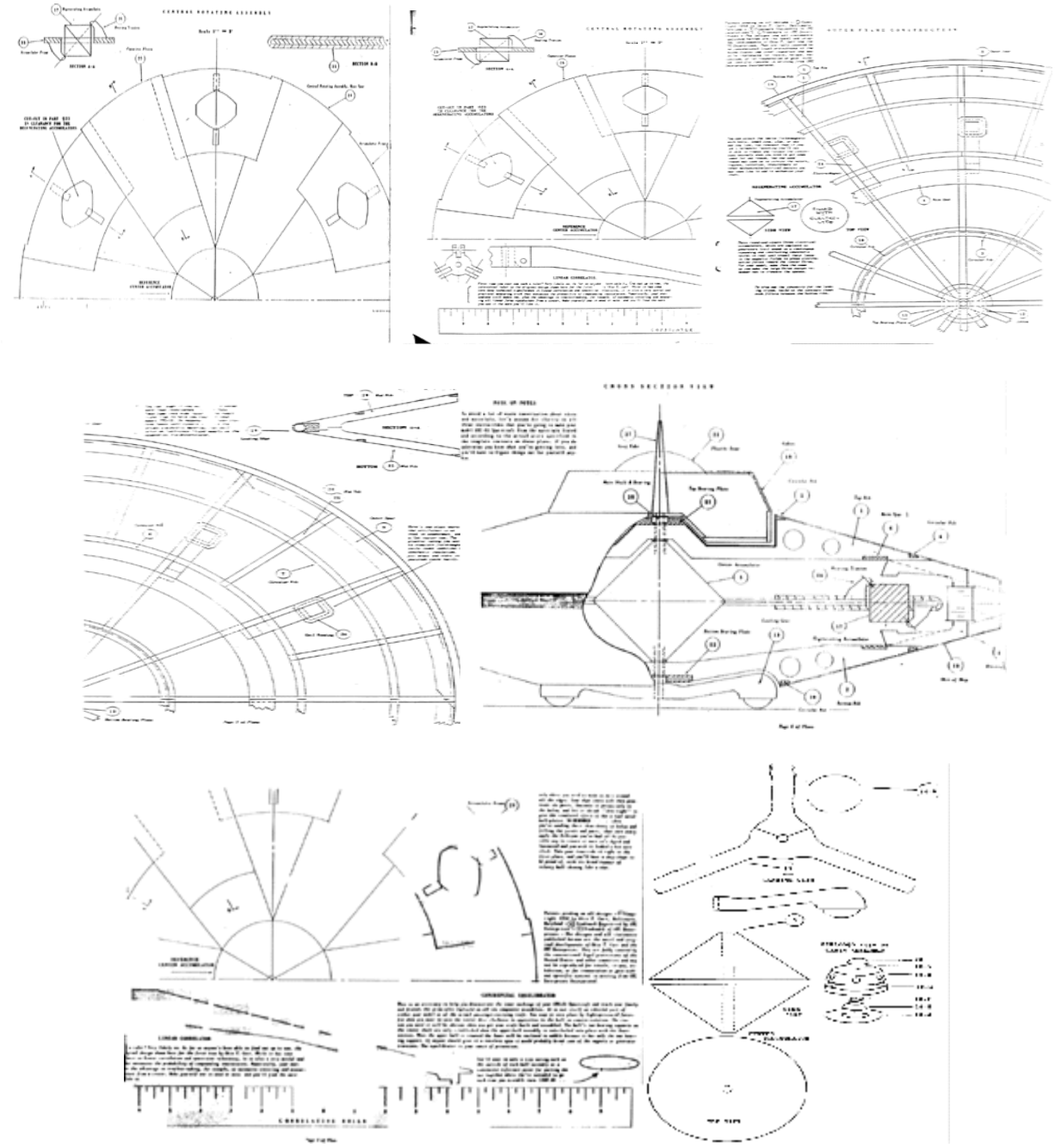
It mechanical behavior being like that of a giant gyroscope, and electrically like a planet with its own atmosphere and force field, the OTC-X1 craft will know nothing of sound barriers, shockwaves, skin friction, turbulence, or G-strains.

Neither will its occupants need fear any harm from cosmic forces, gamma rays, x-rays, or other radiation, because the OTC-X1 craft will either be using or absorbing all such forces, or by the pressure and polarity of its own force field, be shielded against their penetration.

While the commutation system for the actual energized flight model craft is not shown together with the other components on this on this sheet, its design for the circuitry of electro-gravitational forces permits an environmental surroundment of equal and opposite pressures in and from all direction, whose circumference is nowhere and whose center is everywhere relative to the universal field.

Thus, by imitating nature, we become one with nature --- by translating her shapes and duplicating her motions we join forces with natural energies and become magnetically independent of manmade limitations, man-constructed barriers, man-invented feats, and man-imposed controls! [&c, &c., yada yada yada]

Construction Plan Thumbnails: Click on the Images to open the Full-Size Drawings ~



Additional Large Specifications Images (Links open in new windows): [1] ~ [2] ~ [3] ~ [4] ~ [5]

---

http://www.projectcamelot.org/ralph_ring.html

Excerpts from an Interview with Ralph Ring

Ralph Ring is a technician who worked with Otis T. Carr in the late 1950s and early 1960s. Ring stresses that resonance is the key to working with nature: "Resonance. You have to work with nature, not against her." According to Ring, when the model Utrons were powered up to operational speed, "...the metal turned to Jell-o. You could push your finger right into it. It ceased to be solid. It turned into another form of matter, which was as if it was not entirely here in this reality. That's the only way I can attempt to describe it. It was uncanny, one of the weirdest sensations I've ever felt."

Ralph Ring describes Otis Carr thus: "He was an unquestioned genius. Tesla had recognized his quality immediately and had taught him everything he knew. He was inspired, and – like Tesla – seemed to know exactly what to do to get something to work. He was a private man and was also very metaphysical in his thinking. I think the fact that he was not formally trained in physics helped him. He was not constrained by any preconceived ideas. As crazy as it sounds now, he was determined to fly to the moon and really believed it could be done. I believed it. We all did."

Ring described his "flight" in the Utron craft, saying that "Fly is not the right word. It traversed distance. It seemed to take no time. I was with two other engineers when we piloted the 45' craft about ten miles. I thought it hadn't moved --- I thought it had failed. I was completely astonished when we realized that we had returned with samples of rocks and plants from our destination. It was a dramatic success. It was more like a kind of teleportation.

"What's more, time was distorted somehow. We felt we were in the craft about fifteen or twenty minutes. We were told afterwards that we'd been carefully timed as having been in the craft no longer than three or four minutes. I still have no complete idea how it worked. We just built it

exactly according to Carr's instructions. Everything had to be perfect... it all had to be just so, or it he said it would not work: a kind of symbiotic state between man and machine.

"The Utron was the key to it all. Carr said it accumulated energy because of its shape, and focused it, and also responded to our conscious intentions. When we operated the machine, we didn't work any controls. We went into a kind of meditative state and all three of us focused our intentions on the effect we wanted to achieve. It sounds ridiculous, I know. But that's what we did, and that's what worked. Carr had tapped into some principle which is not understood, in which consciousness melds with engineering to create an effect. You can't write that into equations. I have no idea how he knew it would work. But it did.

"...There are two secrets to making the alien saucers work. One is their advanced engineering, and the other is their mental ability."

"I've lost count of the number of people who have refused to believe what happened. I no longer talk about it. It's no fun being laughed at and ridiculed. But I've described it exactly as it occurred. One day someone will build the disk just as we did and they'll have the same experience. All his blueprints still exist. Nowadays, it would all be done with digital and solid state circuitry --- no moving parts would be necessary.

"I've heard that the aliens use the same principle to operate their craft. Their physics seems to work in harness with their consciousness. The craft amplifies the power of their minds. Their craft won't operate without the pilots. I've heard that's why we can't operate their craft --- or, at any rate, we can't operate them the way they do. We're just not adept enough mentally and spiritually. So there are two secrets to making the saucers work. One is the advanced engineering, and the other is the mental and spiritual ability. We may have duplicated some of the first, but we may be a long way from the second yet."

FATE **(May 1958), page 17**

"Gravity Machine?"

The following summary was sent from a Ship's Paper of October 30,1957, after being copied from a CW News broadcast while at sea. It is unusual because no other report of this announcement reached us. It certainly is sensational --- if true.

Baltimore, MD (October 29):--- A group of inventors claimed Monday they have been able to utilize gravity in circular motion machines capable of powering everything from hearing aids to space cruisers.

Otis T. Carr, president of OTC Enterprises, Inc., detailed his claims in an interview and demonstration of a crude model of a circular motion machine which he said is the principle of a "free energy circular foil" spacecraft he can build, if someone puts up the money.

He said the machine can be adapted to devices of any size to produce continuous power absolutely free of dissipation.

Its immediate application, Carr said, would be in a spacecraft --- which would be able to fly among the planets in controlled flight.

It could land or take off as desired on the earth, the moon or any planet in the earth's solar system, he said.

Carr and his associates said their claims are based on the most simple practical applications of natural laws and discoveries in science and mathematics. They have no formal education in science or engineering.

He said the same "free energy" which causes the earth to rotate on its axis and orbit around the sun will turn a machine he described as two cones joined at their circular bases.

When the rotation of such a machine reaches a certain velocity relative to the earth's orbital velocity, Carr said, it will take off.

Carr said the core of his space ship would be a huge battery which would spin at the velocity of the external craft and which would be recharged, he said, by its motion. Carr declared such a battery, built to any size, could be designed to power the largest electric generating plant, operate an automobile, heat a house or power any conceivable machine or device.

The principle on which Carr said such circular motion machines would operate is that "any vehicle accelerated to an axis rotation relative to its attractive inertial mass (the earth) immediately becomes activated by free space energy and acts as an independent force."

***FATE* (August 1959), page 32.**

"The Saucer That Didn't Fly"

by

W. E. Du Soir

The serious field of UFO's and flying saucer research received a setback at Oklahoma City in late April when a highly publicized launching attempt by O.T.C. Enterprises of Baltimore, Md., resulted in failure. Hundreds of persons had been invited to Oklahoma City by Otis T. Carr to watch him "launch a six-foot prototype model of the O.T.C. X-1, a space craft which works on 'utron' energy." Those who were there came away disappointed. The flying saucer did not fly. The six-foot model, well-hidden in a warehouse, never even got to the launching site, or to the amusement park called Frontier City, where it was to have been displayed beside a 45-foot version of the same X-1 which will be an amusement "ride" in the near future.

The launching site was to have been a gravel pit eight miles north of Oklahoma City where Carr claimed the saucer would rise "400 to 600 feet." Launching time was set for 3:00 PM Sunday, April 19. Two and a half hours past this time Major Wayne Aho finally announced that the launching had to be postponed because of "technical difficulties." Later it was stated by O.T.C. officials that one bearing housing was "off one-sixteenth of an inch." Most of the major flying saucer clubs had ignored the "launching". Except for a story in early April there was no advance news on Carr's experiment in Oklahoma City newspapers.

One Oklahoma City television reporter expressed the general feeling of the townspeople, "This thing will never leave the ground. And I feel that a great deal of the ballyhoo they're giving out is tied in with the ride at Frontier City. I have tried constantly to get in to see the saucer model, but they've kept it hidden." Equally well hidden was Carr himself. He was finally located in Mercy Hospital, Room 302, by John Nebel, the famed "Long John" of WOR, New York City. Carr did not show up at a meeting at a local church the day before the scheduled launching but a taped speech was delivered to the 70 people who attended. "Barring any flat tires," Carr said, "I feel that history will be made Sunday afternoon when the model of the O.T.C. X-1 is launched here."

Carr did not leave his hospital room until Monday, when he was taken to the home of Major Aho, the man in charge of publicity for the company. A scheduled "victory" dinner was pretty dismal Sunday night, where again a taped message from Carr was presented. Monday morning at 5 AM a rumor spread that the model launching would again be attempted. At that early hour a group of a half-dozen people, including Norman Colton, Carr's chief aide, went to the warehouse. But it was three hours later before anyone else showed up and most of those who had come to see the model had given up in disgust and left. Many believers in UFO's, although skeptical, had traveled to Oklahoma City to see what developed. All of them had left town by Monday afternoon.

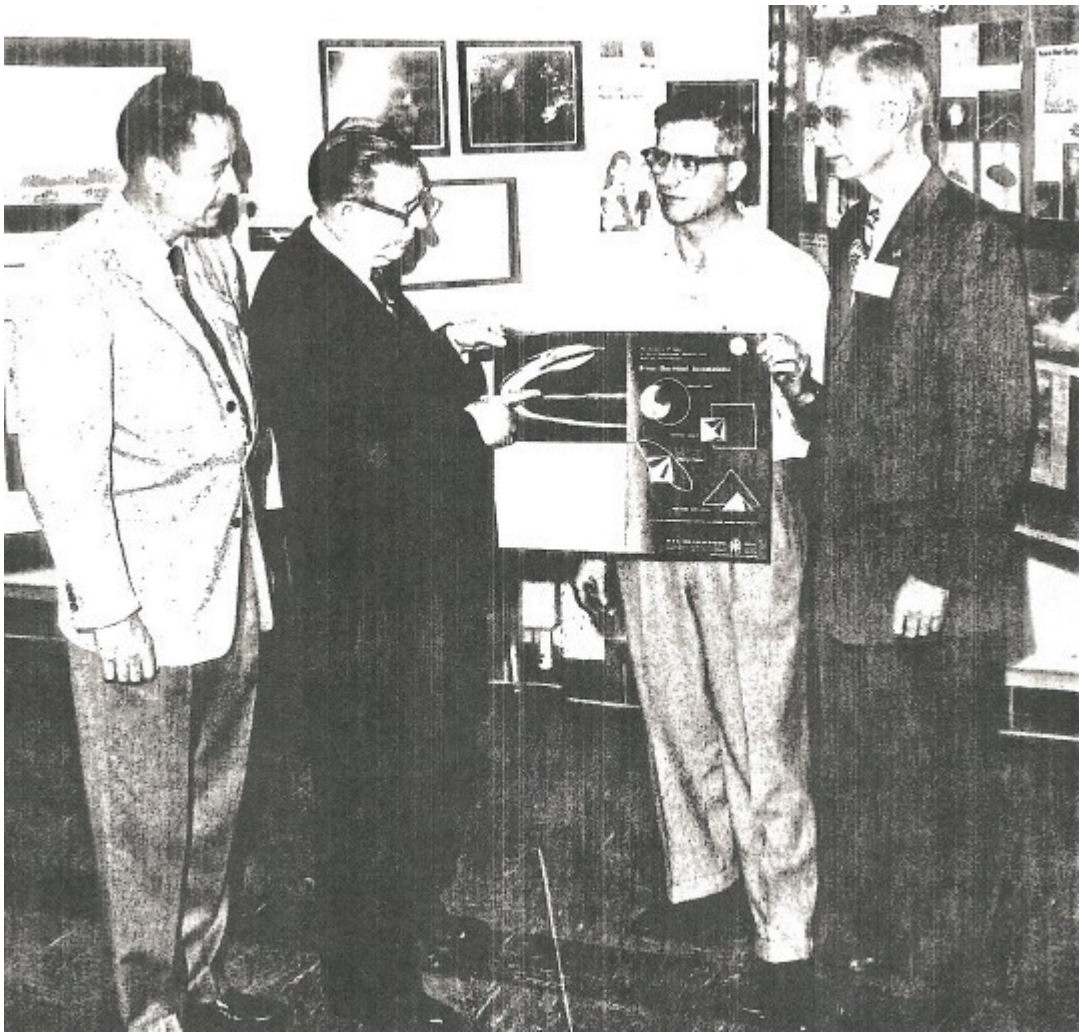
One member of a Pennsylvania saucer club commented, "I don't know what's going on but I feel they never had any intention of trying to launch the model. I could not see any plans in sight for the model and, in fact, I understand, that a Mr. Maywood Jones presented only what he called "three-dimensional illustrations" of Carr's ideas." Monday afternoon there was more activity in the warehouse and finally, around 4 PM, the model was "turned on" and revolved, although it showed no signs of taking off from the table on which it sat. "We hoped to try to launch it again but unfortunately one of the seams burst during the test," an O.T.C. official said. "We still hope to have a launching shortly," another member of Carr's group added. Left unanswered were such questions as:

1) Why was there no publicity about the launching in Oklahoma City for two weeks before the model was supposed to fly?

2) Why did Carr ready a taped message for delivery at the "victory dinner" a day before the scheduled launching?

3) How could any engineer make a mistake of one-16th of an inch in a precision part? This would be similar to a navigator landing an airplane 300 miles off course. A mistake of one-10,000th of an inch can be a major engineering calamity.

Carr was apparently undaunted by the weekend's developments. He again commented, "This indeed is an historic occasion." Questioned about the failures of his model, he added, "The theory itself has been proven. The model will go up, if not this week, then next week or next month." Mr. Carr also has stated that he and Major Wayne Aho will "fly to the moon in a flying saucer on December 7, 1959."



Robert L. COOK Inertial Propulsion Engine

Marjorie Riley: *Vallejo Independent Press* (21 Feb 1987); "Meet Robert Cook, Resident Inventor"
Robert. Cook: "The Conversion of Centrifugal Force Into Linear Force and Motion"
David Doll, *et al.: United Air Lines Test Center & Process Engineering Report* D-71-77 (11-11-1971)
John Davidson: *Concord Transcript* (CA): Thursday 2 December 1971; "Concord Man Invents New Propulsion Plan"
June Land: *Stockton Record* 79(#308); Tues., 12 Feb. 1974; Newton Challenged"
Sue Shoemaker: *The Green Sheet* 59 (#29); Friday, 8 Feb. 1974; "Machine Challenges Newton's Law of Motion"
Robert Cook: US Patent # 3,683,707; "Propulsion System"

R. Cook: US Patent # 4,238,968; "Device for Conversion of Centrifugal Force to Linear Force and Motion"

Robert Cook's Website: www.forceborne.com

The Cook Inertial Propulsion Engine (December 1999) ~

Vallejo Independent Press **(Friday, February 21, 1987)**

"Meet Robert Cook: Resident Inventor"

by Marjorie Riley

Robert Cook, 47, Vallejo's "resident inventor", started "tooling around with machinery" when he was a very small boy.

It's easy to see why. His father, a civil and mining engineer, moved the family "all over the place" as he went from job to job in Texas, Nevada, and California, and in the process taught his son just about everything he knew about mathematics and machinery.

Not long ago this informally educated engineer was granted a patent by the US Patent Office for his "Device for Converting Centrifugal Force to Linear Force and Motion". More recently, he was a guest speaker at the annual dinner meeting of the National Association of Naval Technical Supervisors, Mare Island Chapter. Following the formal lecture, Cook talked "until midnight" with a dozen or so nuclear physicists and scientists who were among the audience about his invention and the book, "The Death of Rocketry" which he recently co-authored with physicist Joel Dickinson.

Pretty impressive when you learn that after graduating from Mt. Diablo High School, young Robert enrolled in engineering school, but quit not long afterwards.

"I was bored", he said, smiling at the memory. "They weren't teaching me anything I hadn't already learned from my dad. It seemed like a waste of time."

Eager to start working with machinery, young Cook became an apprentice printing pressman instead, working for the old Walnut Creek Kernel. Later he worked as first pressman on the big 150-ton Goss Urbanite offset press in Gazette Press, a Berkeley commercial printing press.

Cook is credited with eight separate inventions relating to his printing press days. "It was a good introduction to 'spin dynamics'", he said, "a concept that has fascinated me ever since."

Concerning Cook's recently published book, "The Death of Rocketry", one Association member said, "One chapter begins with an explanation of the principle behind Cook's Inertial Propulsion engine and some thoughts on how our lives will be changed when the device is perfected and in production. Another chapter deals with the controversy that Cook's device has stirred --- it creates an internal force for propulsion and therefore refutes Sir Isaac Newton's laws of motion, particularly the third one which holds that there is an equal and opposite reaction. Cook has charged Newton's laws are incorrect, thus challenging the entire foundation of physics and mechanics, of his device does work."

A news release from The Communication Process in San Francisco states: "The... [invention]... apparently contradicts Newton's third law of motion, and he (Cook) has met with severe criticism and disbelief from scientific and academic establishments. Nevertheless he (Cook) has successfully built numerous working models and is now in the process of building a flying vehicle powered by the CIP unit."

Concerning the invention, Cook himself says: "The rocket was abandoned as a serious means of propulsion shortly after its invention by the Chinese in 1214 AD. Although in recent years the rocket has been revived by the industrialized nations of the world, the extremely low efficiencies involved -- 2% or less -- make it a less-than-satisfactory method of travel, especially for outer space applications. Clearly, of mankind wishes to make significant advance in the exploration of space, an alternative and more efficient means of propulsion must be developed.

"The Cook Inertial Propulsion (CIP) engine provides the new technology needed for a major step forward in space exploration. The CIP engine is not a new energy source, but a tested and proven method of converting Coriolis and centrifugal forces into linear thrust. The result is a reactionless propulsive system powered by conventional energy sources which is expected to yield efficiencies in the range of 80-85% when fully perfected."

"The Conversion of Centrifugal Force Into Linear Force and Motion"

by Robert Cook

Years ago, Albert Einstein remarked:

"When first studying mechanics, one has the impression that everything in this branch of science is simple, fundamental and settled for all time. One would hardly suspect the existence of an important clue which no one noticed for 300 years. The neglected clue is connected with one of the fundamental concepts of mechanics --- that of Mass."

And now, with the discovery of the CIP engine mechanical principle, which has been followed by the successful demonstration of many CIP engine prototypes, another neglected clue in the field of mechanics has been found --- that of an internal, reactionless force which can be produced by converting centrifugal force into a linear thrust.

Science in general has considered centrifugal force a "pseudo force" incapable of affecting motion to any great degree. "Bounded motion" is all centrifugal force was considered capable of producing. I will show that a constant linear force can be produced by centrifugal force when properly controlled.

I will limit my comments on Newtonian Law to his 3rd law of motion regarding action and reaction because my work deals with reactionless force systems deemed unworkable by this 3rd law.

Background of the Experiments ~

In my early experiments starting February 1968, I had originally started to search for a new energy source based on a combination of forces, i.e., gravity, magnetism, and centrifugal force. An error I made in design resulted in the discovery of a new method of propulsion and ended (temporarily) my search for a new energy source. The early system utilized a Coriolis Effect to create the propulsive effect, but it was highly inefficient (about 1%).

A report, "D-71-77" dated 11-11-71 prepared by the engineering staff of United Airlines Test Center in San Francisco, concluded that although highly inefficient, the system nonetheless worked in spite of Newton's laws. A series of accelerometer tests completed in late December 1972 by this same group also proved the system was producing an internal force, but also showed poor efficiency.

After numerous attempts to improve the efficiency of that system which was granted US Patent # 3,683,707, I decided in late 1974 to look for another more efficient method to create unidirectional force.

The series of tests concluded in a 6-month span in 1974 had given me three clues on how to do this, and they were:

1. The system would require counter-rotating rotors.
2. The system would require a series of flexible drive shafts for the rotors.
3. A positive control for the inertia of the propellant mass would be needed.

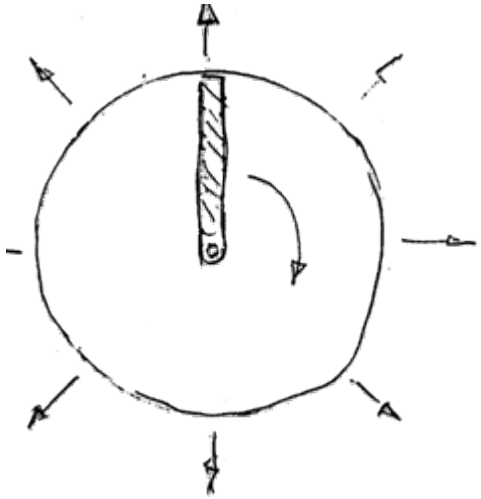
The fourth and final clue would be sound in November of that year. This last clue dealt with the splitting and transferal of the propellant mass.

How the CIP Works ~

In order to understand the reasons for the formerly mentioned series of mechanical actions, we must analyze the effects of unbalanced spinning rotors on wheels in effecting motion.

If we build an unbalanced rotor resembling a one-bladed aircraft propeller (Fig. 1), and spin it in a horizontal plane, it will tend to cause a gyrating force or a force in all directions in that horizontal plane.

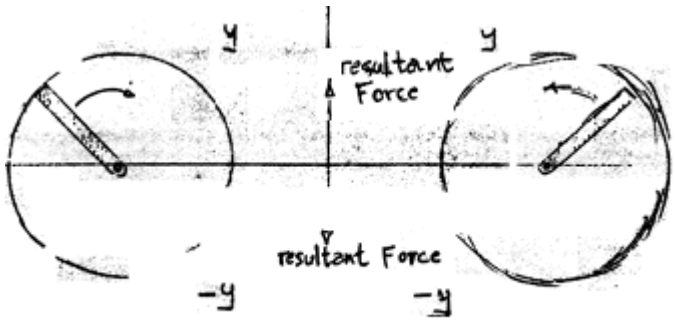
Fig. 1: Unbalanced Rotor ~ ***



(Fig. 1) Unbalanced Rotor

In order to control gyration, we need counter-rotation and synchronization, so if we take two counter-rotating unbalanced rotors and spin them together (Fig. 2), the gyration will become an oscillation or it could be called an alternating force similar to AC current.

Fig. 2: Two Unbalanced Rotors Produce Alternating Force ~ ***



(Fig. 2) 2 Unbalanced Rotors Produce Alternating Force

If the unbalanced centrifugal force is plotted on a graph, it will show a regular sine wave exactly as a single phase alternating current.

If we are to propel with this force, we must rectify it by causing a multiple spin.

The multiple spin is needed in order to effect the "energy state" of the propellant mass. This amounts to an orbit and a spin for the propellant mass.

The reason for this is best shown by analyzing a 2-bladed helicopter rotor.

If a helicopter is not moving through the air, but is sitting on the ground with the rotor spinning at a high speed, and the blade tips are moving at say 300 mph, this velocity will remain the same relative to the environment all around the circle of rotation. If we, some way, could cause the rotor tips to fly off at the 9 o'clock and 3 o'clock positions simultaneously, then the tips would leave in a tangent or straight line to the front and back of the helicopter and their speed would be 300 mph in two different or opposite directions. Their momentum or energy state would be

identical --- the same amount of energy or resisting force would be required to stop them individually. Their energy state is the same.

If the helicopter is then flown forward at say 100 mph, something very interesting happens to the energy state of these rotor tips when they reach the 9 and 3 o'clock positions. If we view the rotor from the top and see it rotating clockwise, the following will become obvious when the helicopter is moving at 100 mph.

1. The rotor (A) at the 9 o'clock position will be moving through the air at 400 mph while rotor B at the 3 o'clock position will move at 200 ph through the air (Pilots must consider the advance ratio of the 'copter blades or it goes out of control.).

2. If we now release the rotor tips in these same positions (3 and 9 o'clock), tip A will leave (in a tangent) at 400 mph, and tip B will leave at 200 mph. The inertial state can be determined by the momentum equation, Momentum = MV.

It's obvious that tip A with twice the velocity will have 2 times more energy and be in a higher energy state than tip B.

The point I am trying to make very clear is that when the center of rotation of 2 spinning masses arranged in this fashion is moved in a straight line (or in a circle like the upper arm of the CIP unit does), the energy state of the two masses will be affected; one mass will increase its energy state, while the other one decreases.

The rotor on the demonstration model is set like a helicopter rotor that spins in a vertical plane instead of horizontal and also orbits. This is what allows one half of the propellant mass to be transferred while in a low energy state.

The Oscillator & Nucleus ~

Once the small rotor sheds one half of its mass, the rotor goes temporarily out of balance and in order to prevent negative force impulses from causing negative effects on the overall system, the rotor is allowed to oscillate and its oscillations are controlled by a built-in Nuclear Mass which actually provides the centripetal force to make the mass, still attached to the small rotor, spin in the ideal fashion. A motion limiting slot as well as a flexible drive shaft complete the unit. Although one rotor unit works well enough to demonstrate the new principle, the ideal configuration is a 12 rotor combination with units based at 120 degree intervals. This will produce a constant force and would have the potential for vertical lift.

A 12 rotor system should be ready for testing by December of 1981.

Endorsements ~

All scientists and engineers (except for2) have endorsed the CIP principle after seeing the model.

Prof. Ching Fong (former chairman of the Physics Dept, UC Davis, and Prof. Of Solid State Physics) has analyzed the system and estimates the energy efficiency potential at 53% and a propulsion efficiency of 98%.

Prof. Durward Jackson of California State University at Los Angeles declares the system "One of the 10 greatest inventions in history".
Countless numbers of engineers have declared it the greatest invention in history!

United Air Lines Test Center & Process Engineering Report

By David Doll, et al.

Introduction ~

On 9-10-71 Robert Cook brought to UAL a device designed to convert centrifugal force into a linear thrust. In spite of being declared in violation of the laws of motion by the US Patent Office, Cook's crudely-built rig moved spasmodically across the floor.

This report provides a dynamic analysis of Cook's mechanism. The cycle demonstrated by Cooke, as well as two other cycles which offer performance improvements, are examined.

Cook's Propulsion Cycle ~

Cook set up his working model so that the propellant mass followed the path shown in Figure 3. From point 1 to point 2 the propellant mass is pinned against the end of the tract by centrifugal force. The thrust seen in tis segment is the component of centrifugal force in the direction of the cart motion. This thrust is:

(1) ***

$$T_{1\text{-}2} = m_p K \omega^2 \cos \omega t$$

where m_p is the propellant mass,

R is one half the sliding distance of the track,

ω is the angular velocity of the rotor, and t is time.

where mp is the propellant mass,
R is one half the sliding distance of the track,
W is the angular velocity of the rotor, and
T is time.

Due to Cook's positioning of the spring, the propellant mass spends more time behind the center of rotation of the track than forward of the center. Thus, the net thrust in segment 1-2 is negative.

When the propellant mass reached point 2, the spring force overcomes the centrifugal force, and the mass accelerates down the tract to point 3. During this portion of the cycle the system acts as a mechanical analogue to a rocket. The propellant mass is accelerated in the aft direction b the spring force and the resultant reaction produces a forward thrust upon the cart. In addition to this reaction force there is Coriolis force which is the inertial effect occurring when a mass is constrained to move in a straight line across a rotating body. The total thrust in segment 1-2 is:

(2) ***

$$T_{2\text{-}3} = 2KR\cos\lambda t\cos\omega t - \frac{4K\lambda\omega m_p}{2K - m_p(\lambda^2+\omega^2)}\sin\lambda t\sin\omega t$$

where K is the spring constant, and

$$\lambda = \left[-\frac{\omega^2}{2} + \frac{K}{2}\left(\frac{1}{m_p} + \frac{1}{m_o}\right) + \frac{1}{2}\sqrt{\omega^2\left[\omega^2 - 2K\left(\frac{1}{m_p} - \frac{1}{m_o}\right)\right] + K^2\left(\frac{1}{m_p} + \frac{1}{m_o}\right)^2} \right]^{1/2}$$

m_o is the mass of the cart.

Where *K* is the spring constant, and

(3)***

$$T_{3\text{-}1} = -\frac{2}{\Delta t}\left(F_o + \frac{m_p^2 R\omega^2}{m_o + m_p}\right)\sqrt{\frac{R}{KR/m_o + F_o/m_p}}\cos\omega t$$

where Δt is the time required to stop the propellant mass, and

$$F_o = KR - m_p R\omega^2$$

m_o is the mass of the cart.

At point 3 the propellant mass strikes the end of the cart producing a negative impulsive force.

where delta *t* is the time required to stop the propellant mass, and:

$F_o = KR - m_pRw^2$

During this segment of the cycle the propellant is stopped at the expense of the forward momentum of the cart.

The resultant thrust on the cart for the entire cycle is shown in Figure 3. [Not Available]

A Modification of Cook's Cycle ~

A significant improvement in performance can be achieved by using viscous damping to arrest the propellant mass [i.e.: "Sorbothane"]. Not only can the large negative impulse be avoided, but by delaying the travel of the mass to the end of the track, the negative centrifugal force component can be reduced.

Cook's cycle could also be improved by the use of a constant force rather than the variable force to accelerate the propellant mass. This would increase the thrust during the ejection stroke by allowing the use of greater force and improving the timing of the stroke.

Concord Transcript **(CA): Thursday 2 December 1971**

"Concord Man Invents New Propulsion Plan"

by John Davidson

Concord resident Bob Cook, 37, has invented a new propulsion system which he says will cut air pollution and power just about anything that moves.

His only problem is that, thanks to Newton's third law, he's having a hard time finding believers.

"For every action, there is an opposite and equal reaction", said Sir Isaac Newton almost 300 years ago.

According to Cook, who is a printing pressman by trade, these few and "somewhat ambiguous" words are greatly responsible for the delay in developing his new system.

Cook says his system is a completely new way of moving cars, airplanes, etc., by converting centrifugal force into a line of "linear force".

At this state, his principle is illustrated in a small working model -- built with hand tools -- that resembles some sort of surrealistic bicycle.

It consists of an aluminum frame, a motor, and four small rotors or "carriers".

The rotors are hollow and they have weights inside, which can slide back and forth. The motor operates a cam which pulls in springs attached to the rotors.

When the invention is started, it powers the frame forward in a series of jerks because of three actions outlined by Cook:

The spinning of a rotor which sends the weight to one end, which multiplies the force at that end;

As the weighted end of the rotor nears the high point of its forward spin the attached string pulls it back. This generates more resistance at the high point, which results in more positive force there.

The negative centrifugal force created by the weighted end of the rotor in its backward spin is nullified by adding more rotors, which are timed so there is a minimum negative force.

Sounds simple? Not really, says Cook, but it could be put into use now if it weren't for Newton.

"Some engineers have interpreted Newton's law to say that such a mechanism will not work (because the backward spin of the rotors presumably would offset the forward spin)", Cook says. "Others say not so."

"Several small models have already been built to test the principle involved and they work", the inventor adds.

"One model was demonstrated at the University of Arizona but it wasn't endorsed because of Newton's law! The model worked but that's besides the point.

Another model was recently demonstrated at the engineering department of United Air Lines in San Francisco. There an engineer was given the job of studying the idea. His conclusion: "The system would work in outer space and might be a good substitute for helicopter rotors", Cook says. "This engineer felt that this system did not violate Newton's law."

Cook also demonstrated a model at NASA's Ames Research Center at Mt. View, but says engineers there refused to believe that the model was really propelling itself with centrifugal force since they felt Newton's law was against it.

"Like all new and really outstanding systems, this idea is being met with skepticism and this could delay its development and eventual use for several years", Cook notes.

Cook, a bachelor who has lived in Concord on and off for almost 20 years, says he has taken time off from his printing trade to work on his system and to try to promote it.

"Off and on for about the last two years I've been conducting experiments in Texas (at a relative's home)", Cook says. He moved to Concord the latest time about six months ago and has been continuing work at the home of friends.

The inventor says he struck upon the idea for his propulsion system accidentally.

"I was more or less working on a motor --- a perpetual motion experiment, just out of curiosity even though that's considered nutty. I made a mistake which put the motor out of balance. Then I realized it was foing to propel itself. It was at that time I became interested in this principle (centrifugal force)."

After that accidental discovery, Cook says he came to Oakland to see a patent attorney, and a patent search was conducted to see if someone had a similar device.

He says he filed for a patent in April 1969, but it was refused on the grounds it was contrary to the laws of mechanics (Newton's third law).

After that, Cook refilled according to a change he had made in the design (he found he had made a slight mistake in the original). That was in October of last year, and that application is still pending.

Right now he says he is in the process of contacting business and getting media coverage.

"I'ld like to see inventor William Lear, who's working with a steam turbine of cars", the local inventor says. "I'm looking of someone to help me develop my system."

The most important use of his device would be in cars, Cook says, since it could be helpful in cutting smog.

"It can be used on just about anything that moves", he says, noting that it could be powered even by solar energy in space. "All you need is something to cause the rotors to spin."

In an actual full-sized motor, he adds, there would have to be an 18-rotor mechanism (the rotors would only have to be 8 inches long each).

He centrifugal force propulsion system is not Cook's invention -- he says it's his eighth. "Practically all of the rest dealt with the printing trade", he says. "They've all worked. But financially speaking, the inventions were too late since those types of presses were just about obsolete."

Cook, who has a high school education, says he is "more or less self taught. I'm just curious -- machinery fascinates me; it just comes second nature to me."

The inventor claims his centrifugal force system really does not oppose Newton's law. "When the frame moves, that's the reaction (in Newton's principle). This system just diverts the reaction."

Well, they doubted Copernicus and Freud too...

***Stockton Record* 79(#308); Tues., 12 Feb. 1974**

"Newton Challenged"
by June Land

Isaac Newton's third law of motion may well have been contradicted Monday afternoon in Stockton.

A contraption resembling a child's large-scale erector set model, described by its inventor as an internal propulsion device, passed its final test -- it moved forward on almost frictionless ice.

Newton's law says that for every action there has to be an equal and opposite reaction, or to put it another way -- for a body to move it must be acted on by an outside source.

"Newton made a mistake, that's all", said the inventor, Bob Cook, 39, of Pittsburg, who maintains the device will revolutionize transportation.

The device is made of counter-rotating cams and gears resting on thin blades that are powered by an electric motor, but battery or even solar power could be used, says Cook.

He explained the contraption is propelled by the so-called "phantom" Coriolis force trapped inside the rotors which results in the motion despite the absence of friction.

Webster identifies the Coriolis force as corresponding to the Coriolis acceleration of a body equal to the product of the mass by the Coriolis acceleration and responding as a result of the earth's rotation for the deflection of projectiles and the motion of the winds to the right in the northern hemisphere and to the left I the southern hemisphere.

Skeptics claimed the device would "just sit there and rock back and forth" if all friction were eliminated, said Cook.

It moved forward in short spurts Monday afternoon at Oak Park Ice Rink, however. Cook maintains the experimental model can be improved to get a more constant force by more and a better combination of rotors.

"I have definitely proven the principle is sound by doing all the tests that are required. Now I have to determine the efficiency", he explained.

Some of the tests included movement on an air cushion suspended from ropes and in a raft floating in a swimming pool.

People say it can't work because it defies the laws of nature", said the soft-spoken and rather shy inventor who admitted he has no formal education.

He was a printer for about 18 years in the East Bay area and says he stumbled on the idea for the contraption when he was experimenting with a new energy source.

"I made a mistake and came up with this."

Cook has been working on the test model for about 6n years and has invested some $50,000, according to an assistant, Joel Dickenson, 24, of Pittsburg.

Cook claims the device can be used to propel automobiles and "could even move in space" if solar power were used.

He patented the device in 1972 and the next step is to either raise capital to produce a working model or to sell the idea to a manufacturer, said Dickenson.

The Green Sheet **59 (#29); Friday, 8 Feb. 1974**

"Machine Challenges Newton's Law of Motion"

by Sue Shoemaker

An apparently simple, 85-pound device which Bob Cook of Pittsburg has invented may not revolutionize transportation and aerospace industries overnight -- but then again maybe it will.

Cook has spent the last six years and about $50,000 developing what he claims is a revolutionary new method of propulsion, which defies scientific laws of nature.

Despite doubts ranging from skepticism to outright disbelief on the part of scientists and engineers at Ames Research Center and United Air Lines, Cook says his device in a more sophisticated form would be capable of solving the energy crisis and propelling any vehicle, from bicycles to space craft.

Basically, Cook's device consists of four rotors mounted in two levels on a frame. Atop each rotor is a weight which slides back and forth in a short track.

As the rotor turns forward, the weight, attached by a spring to the frame of the machine, slides forward, jerking the machine forward.

As the rotor continues its revolution the weight slides back, but because the speed of the rotor has been reduced the weight moves back with less force than it moves forward, so although the machine jerks backward, the backward jerk is weaker than the forward jerk and the net effect seems to be a slight forward movement.

The forward thrust is intermittent, occurring only when the weight slides forward once per revolution, but Cook and his assistant, Joel Dickinson, are working to improve it by making the forward thrust continuous.

Cook acknowledges the device he is now testing is a crude model, "sort of like the Wright brothers' first plane", he says with a chuckle. Although rotor ovelment is now very slow, he says it and the speed of the machine could be increased 1,000 times.

"With the help of advanced hydraulics and ball bearings, there would be hundreds of uses for it", he says.

Cook was testing the device at Buchanan Air Field in Concord Wednesday and planned to take it back to Ames later in the week. Although it is currently powered by electricity, he says one of the device's most revolutionary features is that it can run on any type of power, from steam to solar energy.

In addition, he claims the machine needs relatively little power to reach great speeds, an important factor in times of fuel shortage.

"This form of inertial propulsion could eventually be the most widely used form of propulsion. It could outrun anything we have now", he predicts.

And even of more scientific significance, Cook and Dickinson, who admitted he was an "A-1 skeptic" until he saw the machine, are sure the invention disproves Newton's Third Law of Motion, that every action has an equal and opposite reaction.

They are confident that once it is accepted by the scientific establishment the device will force a reevaluation of the basis of physics and revolutionize the entire field.

But acceptance does not seem forthcoming, although scientists at both United Airlines and Ames have been sufficiently interested in the device to test and analyze it.

Their conclusion has been that, on a theoretical basis the device should not work; that according to known scientific principles it cannot contradict Newton's Law and do what Cook believes it does.

But to David Doll, an aeronautical engineer at United, this does not entirely rule out the possibility Cook has really discovered something.

"He may have something in this invention which is not covered by simple Newton's Law analysis", Doll says. He added according to Newtonian analysis the helicopter should never have worked.

"Maybe he's got another helicopter", he says.

According to Doll, the United scientists concluded the device would not be practical for use by the airlines. In addition to certain technical problems which would be encountered in adapting the device on a large enough scale to lift and propel planes, he says the method is substantially less efficient than current means of propulsion.

"But it's an interesting device", Dell says. I can't really see any promise for it in the industry but its fun to watch. I'm kind of rooting for him."

An Ames scientist who is familiar with Cook's work is more discouraging. While the device may have limited success on earth, it would never work in deep space, he claims.

"He's trying to violate the laws of nature and not having much success", he said. "But it might be nice as a Christmas toy for the kids."

Dr. John Trenholm, a physicist at the University of California Lawrence Laboratory at Livermore, is unwilling to be quite so strong in his skepticism.

"I have my doubts that it does what he thinks it does, but the important thing is to see if it performs and then try to explain why", Trenholm says.

And even if Cook has developed a new form of propulsion, Trenholm says, it is probably so weak that it will never prove useful in transportation.

But even limited success would be very valuable to science, he adds. "The value would not be in practical applications but in pointing out to scientists that in some small way the principles on which they base their work is wrong.

The discovery of just such an "error" years ago led to the development of the hydrogen bomb, he said.

"The scientific community is not always right", Trenholm pointed out. "There's no fundamental reason why someone in their backyard in Pittsburg can't come up with something really significant."

A former printing pressman, Cook has worked full time on his invention for the past six years. Although he has had no advanced training in engineering or physics he says he comes from a "long line of engineers and physicists".

US Patent # 3,683,707
"Propulsion System"
Robert Cook

Figures only... Link to the complete patent -- PDF format -- at the European Patent Office:

http://l2.espacenet.com/espacenet/bnsviewer?CY=ep&LG=en&DB=EPD&PN=US3683707&ID=US+++3683707A1+I+

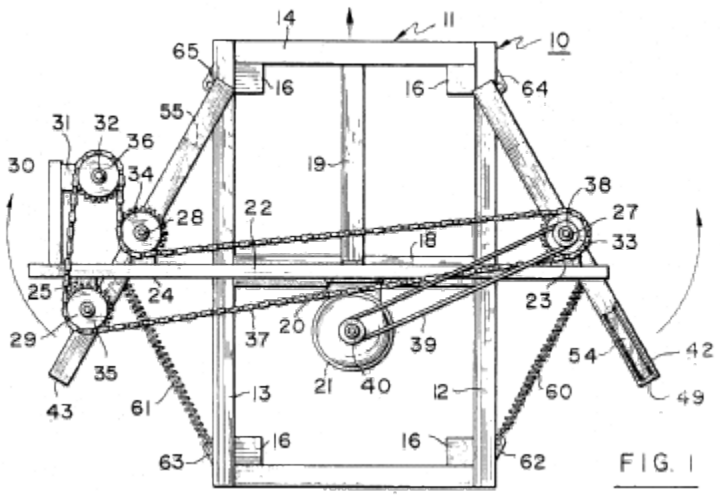


FIG. 1

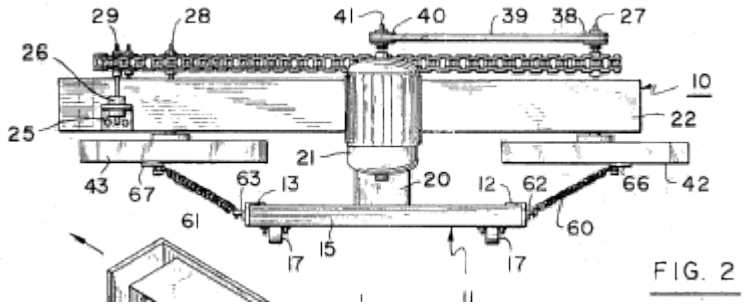


FIG. 2

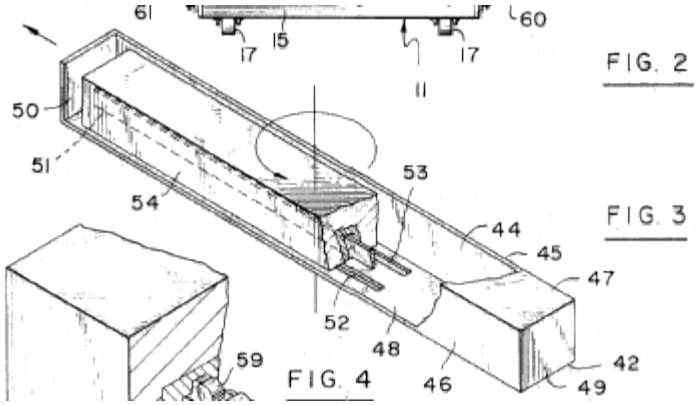


FIG. 2

FIG. 3

FIG. 4

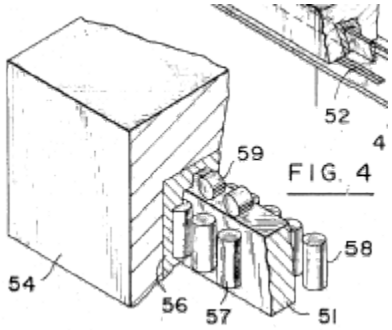


FIG. 4

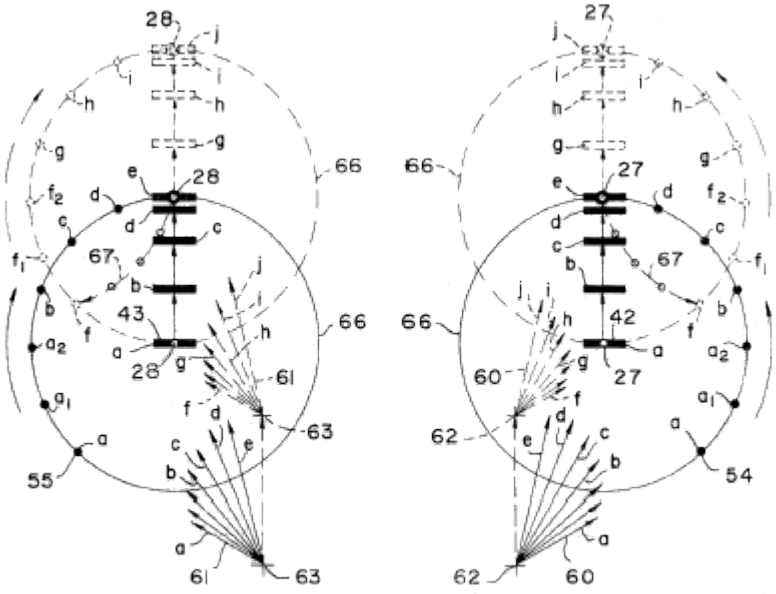


FIG. 5

US Patent # 4,238,968

Robert Cook
December 16, 1980

"Device for Conversion of Centrifugal Force to Linear Force and Motion"

Abstract ~

A device to employ centrifugal force for use as linear motion utilizing a pair of counter rotating arms about a common axle. One arm contains a mass splitable and transferable to the other arm and back again at one hundred and eighty degree intervals. The device may include a surface travel system or two of such devices may be employed in tandem for any mode of travel.

Inventors: Cook; Robert L. (605 Wilson Ave., Vallejo, CA 94590)
Appl. No.: 945245 Filed: September 25, 1978

Current U.S. Class: 74/84R; 74/84S Intern'l Class: F16H 033/20
Field of Search: 74/84 R,84 S
References Cited [Referenced By]
U.S. Patent Documents:
1,953,964 ~ Apr., 1934 ~ Laskowitz 74/84.
2,009,780 ~ Jul., 1935 ~ Laskowitz 74/84.
2,306,723 ~ Dec., 1942 ~ Floraday 268/124.
2,350,248 ~ May., 1944 ~ Nowlin 74/61.
3,555,915 ~ Jan., 1971 ~ Young, Jr. 74/84.
3,683,707 ~ Aug., 1972 ~ Cook 74/84.
3,968,700 ~ Jul., 1976 ~ Cuff 74/84.

Primary Examiner: Herrmann; Allan D. Attorney, Agent or Firm: Bielen and Peterson

Claims: [Claims not included here]

Description

BACKGROUND OF THE INVENTION

The present invention relates to a device for the conversion of centrifugal force to linear force and, therefore, linear motion. The device may be used to propel any common vehicle such as automobiles, rail cars, and marine, aviation and space carriers, and the like.

As enunciated by Sir Issac Newton, an object directed along a curved path will exert a force against the retraining or directing item. In other words, a force is produced by an object that constantly changes direction, since a change in speed or direction constitutes acceleration. As is well known, the centrifugal force is directly proportional to the mass of the object, or the radius of the circle through which the object moves, or the square of the angular velocity of the spinning object. Therefore, doubling the number of revolutions per minute of the object, will increase the centrifugal force by a factor of four (4).

Centrifugal force often expressed in the amount "times" the normal pull of gravity or "g's", may produce a surprisingly large force. For example, an object following a circular path having a radius of ten centimeters, at a rate of six hundred revolutions per minute, generates a centrifugal force which is 41 times gravity.

As can be surmised, a device that enables the transformation of the centrifugal force produced by a rotating body into a linear force, with only a modest efficiency, may be applied to any mode of vehicle travel.

In the past, various attempts have been put forth to reap the advantages of the powerful and easily generated centrifugal force by effecting such a transformation. For example, these apparatuses have rotated mass members and shifted the center of gravity relative to the axis of rotation. The result has been the development of a centrifugal force greater where the mass has shifted, than the remainder of the rotational cycle. In essence, the length of the radius of the arm has been changed. As is well known, the conservation of angular momentum would tend to correspondingly decrease the speed of the mass shifted.

As an example of a successful machine of this type, reference is made to U.S. Pat. No. 3,683,707, issued on Aug. 15, 1972, to applicant. However, machines of this type, although workable, are not efficient enough to produce the desired linear force to warrant general use.

SUMMARY OF THE INVENTION

The present invention provides a device for converting the force of a spinning or rotating mass into a linear component of force usable to propel a vehicle in a linear path.

In accordance with the present invention, a first rotating arm is provided, moving about an axis of rotation. A pair of balanced masses rotates at the terminus of the arm in a plane perpendicular to the plane of the first arm. A second arm counter-rotates about the same axis with respect to the first rotating arm and moves within a plane parallel to the plane of rotation of the first arm. A mechanism cooperative between the first and second arms permits the transfer of one of the balanced weights from the first arm to the second arm. At a selected point in the rotational path of both arms, one of the masses transfers causing cancellation of the centrifugal force produced by the first rotating arm. The mass again transfers from the second arm to the first arm after one hundred eighty degrees of circular travel of both arms. At this point, there is a centrifugal force bias in favor of the arm having the masses which continues for another one hundred eighty degrees of arcuate travel, when compared to the prior semicircle traveled. In other words, the net result of the arm having the pair of masses is an imbalanced centrifugal force during half of the circular path of both arms.

The resultant imbalance may be transmitted into a linear uni-directional component of force by mounting both rotating arms on a rail or frictional wheel carriage.

Usage of two synchronized sets of counterrotating arms to a leg connecting both axes of rotation, necessarily eliminates the deflecting component of the centrifugal force along the axes of the counter rotating arms. In this case, the rail and frictional wheel carriage would not be required since a true linear force has been fashioned.

It is, therefore, an object of the present invention to provide a device that efficiently converts centrifugal force from rotating members into linear force and linear movement.

It is a further object of the present invention to provide a device useable as a source of motivation for any vehiclar means by the employment of rotational motion which is converted into linear motion.

It is yet another object of the present invention to provide an imbalanced centrifugal force in a given semicircle of the rotational cycle of an object and the usage of the linear components of the centrifugal force produced to propel a vehicle.

It is another object of the present invention to combine the effects of a plurality of devices producing a biased centrifugal force to cause linear motion without the necessity of frictional engagement of the vehicle with a surface of travel.

The invention possesses other objects and advantages as concerns particular features and characteristics, thereof, which will become apparent as the specification continues. For a better understanding of the invention, reference is made to the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the device with the counter rotating arms shown in phantom at the transfer points.

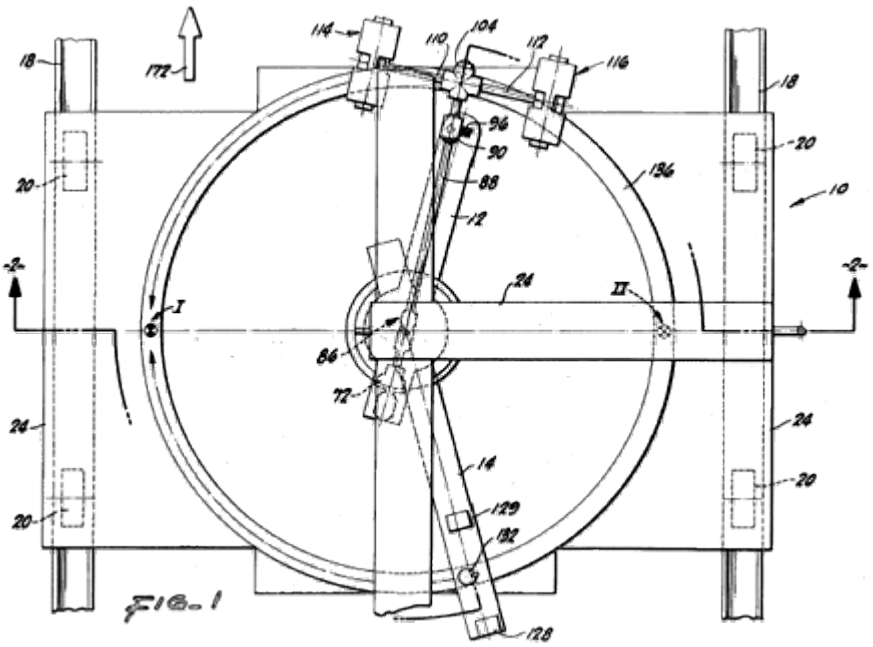


FIG. 2 is sectional view taken along line 2--2 of FIG. 1.

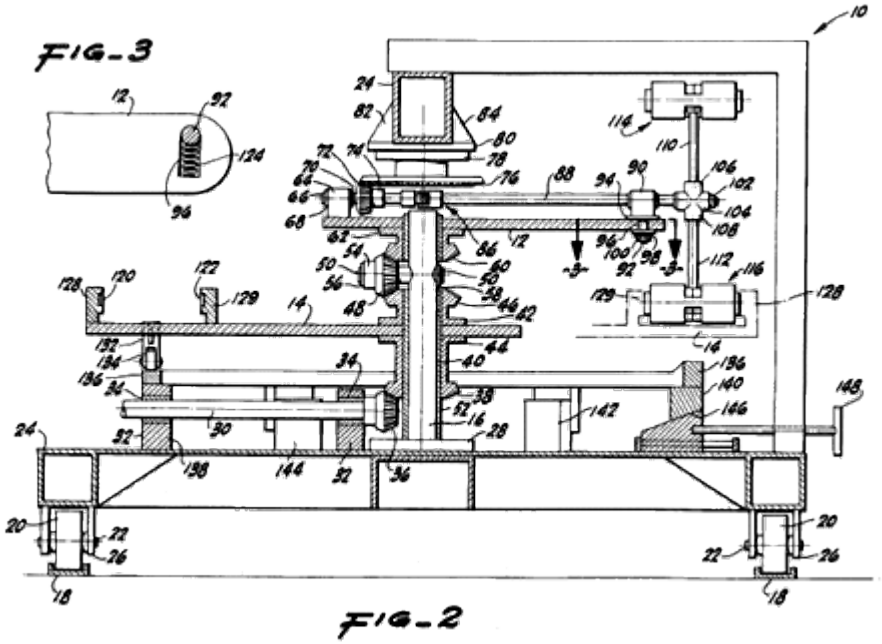


FIG. 3 is a broken sectional view taken along line 3--3 of FIG. 2.

FIG. 4 is a broken side elevational view of the mass transfer mechanism in the activated position.

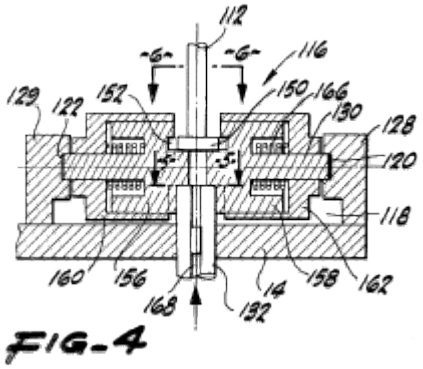


FIG-4

FIG. 5 is broken sectional view taken along line 5--5 of FIG. 4.

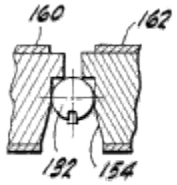


FIG-5

FIG. 6 is a broken sectional view taken along line 6--6 of FIG. 4.

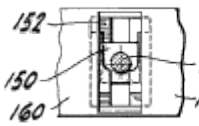


FIG-6

FIG. 7 is a broken side elevational view of the mass transfer mechanism in the deactivated position.

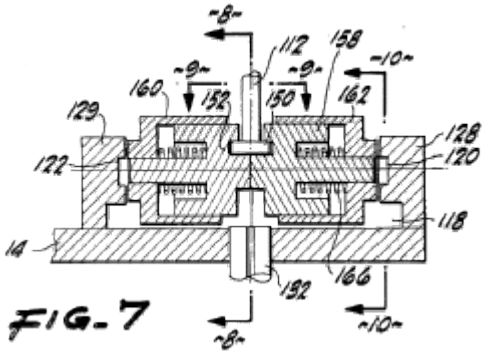


FIG-7

FIG. 8 is a broken sectional view taken along line 8--8 of FIG. 7.

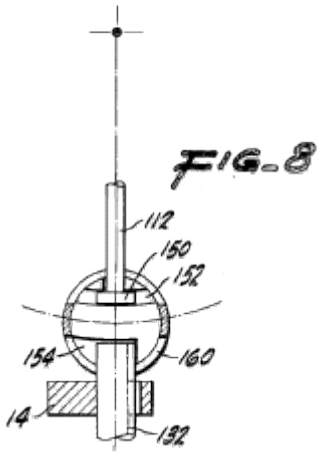


FIG. 8

FIG. 9 is a broken sectional view taken along line 9--9 of FIG. 7.

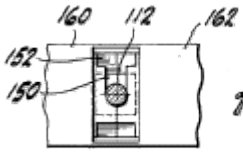


FIG. 9

FIG. 10 is a broken sectional view taken along line 10--10 of FIG. 7.

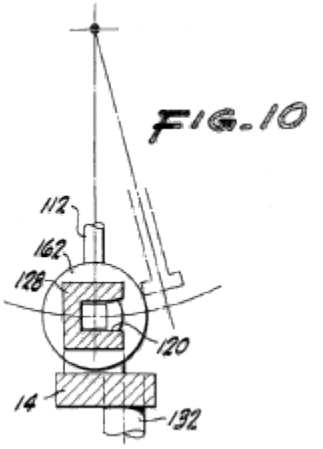


FIG. 10

FIG. 11 is a fragmentary sectional view showing a pair of devices in side-by-side connection.

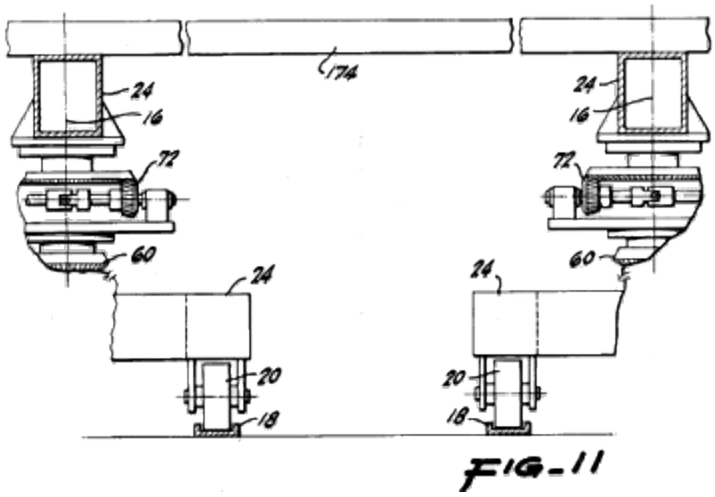


FIG-11

FIG. 12 is a schematic view showing a pair of devices in side-by-side connection, with the connecting leg in phantom.

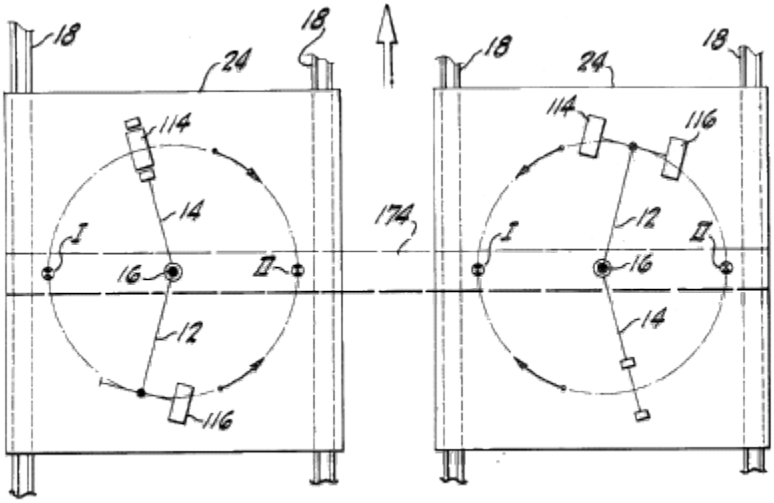


FIG-12

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, the device or apparatus as a whole is depicted in its entirety by reference character 10. FIG. 1 shows the device 10 which includes a first arm 12 and a second arm 14 which counter rotate with respect to one another about an axle 16, FIGS. 1 and 2. The circular paths of the arms 12 and 14 lie in parallel planes such that the arms are positioned in overlying alignment twice during the rotational cycle of both arms 12 and 14. As shown by FIG. 1, in partial phantom, the alignment of the two arms takes place one hundred and eighty degrees (180.degree.) apart and these positions are denoted as the "transfer points I and II", a fuller explanation of which will be hereinafter provided.

In the present embodiment, the device 10 is contemplated for use on a surface, but the device may be employed for any method of travel including travel in water, air and space media. As shown, the device 10 travels on a rail track 18 by the use of wheels rotating about spindles 22

that support frame 24, via forks 26, which are fixed by attached to frame 24 and spindle 22. The frame 24 secures to axle 16 by the use of flange 28 by any suitable means, such as welding.

With reference to FIG. 2, driving shaft 30 turns by the energy derived from any source of power (not shown). Block portion 32 and bearings 34 support shaft 30 to allow smooth axial turning of the shaft, well known in the art. Shaft 30 includes a miter gear 36, on the end nearest axle 16, which meshingly engages bevel gear 38 integral with bushing 40, which is free to slide about the bearing surface 52 circumferentially affixed to axle 16. Flanges 42 and 44 afix to arm 14 such that the rotation of bushing 40 rotates arm 14 about the axis of axle 16. The upper end of bushing 40 connects to bevel gear 46 which meshingly engages miter gear 48. Stud 50 fixedly engages axle 16 and bearing 54 circumscribes the stud 50. Miter gear 48, thus rotates about the fixed axis of stud 50. C-rings 56 and 58 prevent the movement of stud 50 and miter gear 48.

Bevel gear 60 meshingly engages miter gear 48 and rotates in the direction opposite to bevel gear 46. Flange 62, depicted as integral with bevel gear 60, affixes to arm 12 such that arm 12 rotates opposite to arm 14.

One end of arm 12 includes a bearing mount 64 which circumferentially holds shaft 66. Pin 68 positions shaft 66 within bearing 64 which has a seal 70. Miter gear 72 affixes to shoulder 74 which surroundingly engages shaft 66. Miter gear 72 meshingly engages bevel gear 76 and turns shaft 66. Flanges 78 and 80 join to hold bevel gear in a stationary position with respect to miter gear 72. Stiffeners 82 and 84 strengthen the interconnection of flanges 78 and 80 to the frame 24.

Universal joint 86 affixes shaft 66 to shaft 88 which passes through bearing mount 90. Stub 92 affixes to base plate 94 which secures to bearing mount 90. Stub 92 passes through an arcuate slot 96 in arm 12, best depicted in FIG. 3; the purpose of which will be described in detail as the specification continues. The lower end of stub 92 is capped by washer 98 and nut 100. Stub 92 may travel within the confines of arcuate slot 96 subject to dampening by spring 124.

Shaft 88 engages bearing 102 which fits within hub 104 having wings 106 and 108. Bars 110 and 112 affix to wings 106 and 108 respectively on one end and to masses 114 and 116 on the other end. Masses 114 and 116 are preferably of equal size; mass and weight, therefore, balance one another when shaft 88 rotates bars 110 and 112 (which are of equal length) and the masses 114 and 116. The hub 104 also functions to dampen oscillations upon the transfer of one of the weights, as will be discussed in detail hereinafter. Arm 14 has a U-shaped channel 118 between partitions 128 and 129 corresponding in the width dimension to the width of mass 114 or 116. Opening 120 and 122 receive the fingers (not shown) of mass 114 or the fingers of mass 116 (only exemplar finger 130 shown) dependent upon which mass is transferred from arm 12 to arm 14.

Pin 132 rides on cam follower 134 which travels a flexible circular cam on track 136. Cam track 136 is supported by a plurality of blocks, including blocks 138, 140, 142, and 144. Block 140 includes an inclined surface having a handle structure 144 thereattached, such that the circular track 136 may be lowered to the same level at block 140 as it is at block 138.

The mechanism involved in the actual transfer of one of the masses 114 or 116 may be more clearly explained by FIGS. 4-10. As an example, mass 116 may be employed, as depicted in phantom on FIG. 2, as the transferred mass. FIG. 4, showing the mechanism in the activated position, includes bar 112 having a plate 150 which fits into arcuate channel 152. Bar 112 affixes to plate 150. The combination is capable of holding weight 116 while revolving about hub 104. As depicted by FIG. 5, the pin, when elevated by the track 136, runs through partially V-shaped channel 154.

The mass 116 includes two equal portions 156 and 158, each portion respectively enclosed by caps 160 and 162, having a slidable relationship therebetween. Finger 130 of mass portion 158 slides within openings 164 and into slot 120 when the mass 116 transfers from arm 12 to arm 14. Spring means 166 urges mass member 158 away from slot 120 while the movement of pin 132 in channel 154 urges mass member 158 toward slot 120. Mass portion 156 also includes a finger, spring means, and opening arrangement (not shown) identical to mass portion 158 such as finger 130, spring means 166, and opening 164, for use with opening 122 (FIG. 2).

Pin 132 includes a slot 168 and a key 170 in arm 14 to prevent rotation of the pin 132 in the vertical plane during transfer of the mass 116. Mass 114 contains the same mechanism as mass 116 for the purposes of the transfer, from arm 12 to arm 14, and the masses be substituted freely to perform the transfer function to evenly distribute wear and tear and the like.

In operation, the device 10 has two counter rotating arms 12 and 14 that are synchronized to vertically align at two positions within their rotational cycles, where either mass 114 or 116 transfers to and from the first arm 12. As heretofore explained, mass 116 has been arbitrarily chosen, but proper calibration may employ mass 114 in the transfer mechanism herein described.

Power from a source drives driving shaft 30 which turns miter gear 36 and bevel gear 38. Arm 14 affixed to bushing 40 rotates in a plane substantially horizontal to the axis of driving shaft 30. Bevel gear 46 turns miter gear 48 which spins bevel gear 60. Arm 12 attached to flange 62, integral with bevel gear 60, rotates in a plane parallel to the plane of arm 14 and in an opposite direction to the path of rotation of arm 14 through gearing arrangements arms 12 and 14 vertically align at "transfer points I and II", shown on FIG. 1.

Miter gear 72 and bevel gear 76 rotate shaft 88 and turns masses 114 and 116 in a vertical plane as arm 12 rotates in a horizontal plane. At transfer point I, depicted in FIG. 2, the mass 116 fits between partitions 128 and 129, shown in phantom, of arm 14. At this point, the mass 116 the end of arm 14 has no relative motion therebetween. Just prior to that point, pin 132 enters channel 154 because of the rise in track 136 and spreads portions 156 and 158 apart. Fingers, shown by exemplar finger 130, enter openings 120 and 122, and bar 112 with affixed plate 150 rotates out of arcuate channel 152. Thus, mass 116 has been transferred to arm 14, FIGS. 4-6.

Arm 12 continues its rotation with only mass 114 for one hundred and eighty degrees to "transfer point II". It should be noted that hub 104 preferably dampens the oscillating motion produced by mass 114 on the arm 12 by being of a weight equal to the combined weight of masses 114 and 116. Likewise partitions 128 and 129 should be equal in weight to hub 104, such that the sum of the weight of masses 116 and partitions 128 and 129 equals the sum of the weight hub 104 and weight 114. Thus, the device 10 is balanced during the portion of the cycle of arm 12 between the "transfer points I and II".

With reference to FIG. 3, the stub 92 bears on spring 124 such that the oscillation force of mass 114 on arm 12 is dampened in one direction to help smooth the motion of arm 12 as it rotates.

When "transfer point II" is reached, the transfer mechanism reverses, FIGS. 7-10. Pin 132 lowers from channel 154 because of the position of track 134. Fingers, shown by exemplar 130 remove from openings 120 and 122. Plate 150 engages portions 158 and 160, FIG. 9, and mass 116 again rotates on bar 112 with mass 114.

The mechanical components of device 10 may be sealed in a vacuum with shaft 30 and handle structure 148 extending therethrough to reduce the effect of air friction on the rotating arms.

When arm 12 includes both masses 114 and 116, axle 16 receives a force along arm 12. This specifically occurs counterclockwise between "transfer point II" and "transfer point I". This

linear force may be broken into two component forces, one in the direction of the arrow 172 and the other in a force horizontally disposed. The horizontal force, a deflecting force, is absorbed by the rigidity of rail track 18. Thus, device 10 moves along track 18 in the direction of the arrow 172. It should be noted that a plurality of pairs of arms identical to arms 12 and 14 may be placed on axle 16 to create a steady force in the direction of arrow 172. The device 10 alone will produce a pulse force during the time arm 12 travels from transfer point II to transfer point I. The transferring mechanism may be deactivated by pulling handle mechanism 148 and therefore the lower portion of bock 140. The sliding of the upper and lower portions of block 140 on surface 146, lower arm track 136 such that pin 132 does not enter channel 154 and transferring of mass 116 does not occur. Similarly the raising of track 136 one hundred and eighty degrees from block 146 would reverse the transfer mechanism such that the device 10 would travel in a direction opposite to arrow 172. In other words, raising the track 136 to activate pin 132 opposite block 140 would brake device 10 moving in the direction of arrow 172 or cause device 10, at rest, to move in a direction opposite to arrow 172.

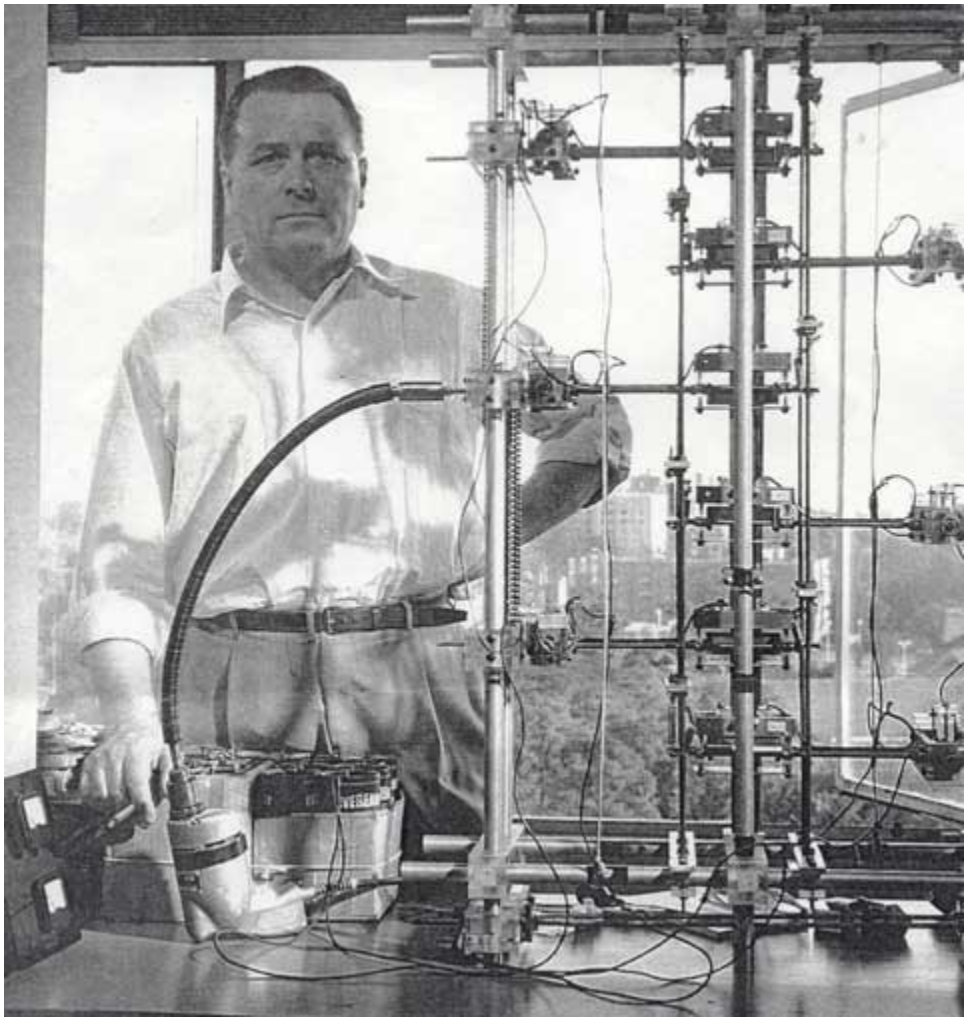
Device 10 may be used with an identical device to eliminate the need for rail track 18 and its equivalent. Applicant hereby incorporates, by reference, the specification of his U.S. Pat. No. 3,683,707, issued Aug. 15, 1972, wherein applicant describes the cancellation of horizontal forces. In particular, column 8, lines 9-38, describes the resolution of forces in the Y axis and cancellation of the forces in the X axis.

By analogy, a set of devices identical to device 10 may be placed together, preferably side-by-side, with a leg 174 connecting identical axles 16 such that identical arms 12 are located at transfer point I on the first device and transfer point II on the second device FIGS. 11 and 12.

While in the foregoing specification embodiments of the invention have been set forth in considerable detail for purposes of making a complete disclosure of the invention, it will be apparent to those of ordinary skill in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

Norman L. DEAN Inertial Drive

http://www.deanspacedrive.org/ --- Dean family website
Norman DEAN (II) ~ Photos & Documentation



Norman L. Dean
[Photo source: Wikipedia]

Wikipedia Entry

John W. Campbell: "The Space Dive Problem"; Analog (June 1960)

Norman L. Dean: US Patent # 2,886,976 --- System for Converting Rotary Motion into Unidirectional Motion

N. Dean: US Patent # 3,182,517 --- Variable Oscillator System

William O. Davis: "The Fourth Law of Motion"; *Analog* (May 1962)

G. Harry Stine: "Detesters, Phasers and Dean Drives"; *Analog* [Date unknown]

John W. Campbell: "Instrumentation for the Dean Drive"; *Analog* (November 1960)

---

http://en.wikipedia.org/wiki/Dean_drive

Norman L. Dean --- The Dean Drive

Role of John W. Campbell

The Dean drive obtained a good deal of publicity in the 1950s and 1960s via the columns of John W. Campbell, the longtime editor of *Astounding Science Fiction* magazine. Campbell apparently believed that the device worked and claimed to have witnessed it operating on a bathroom scale. The weight reading on the scale appeared to decrease when the device was activated. He subsequently published photographs of the scale with the drive stopped and running. The June 1960 cover of *Astounding* magazine featured a painting of a United States submarine orbiting Mars, supposedly propelled there by a Dean drive.

Dean, who was trying to find potential buyers for his technology, was secretive about the details of how it was supposed to work, but it was said to contain asymmetrical rotating weights and to generate a great deal of vibration.

Dean and Campbell claimed that Newton's laws of motion were only an approximation, and that Dean had discovered a fourth law of motion. This has been described as a nonlinear correction to one of Newton's laws, which, if correct, would allegedly have rendered a reactionless drive feasible after all.

Skeptics maintain that there are many possibilities for illusory effects, involving interactions of vibration, friction, resonance with the springs of the scale, instantaneous photographs of an oscillating scale reading, and so forth. Some even go so far as to attribute the reported demonstrations to outright deception, either by Dean or by witnesses.

Further Developments

Purportedly, several groups (including Westinghouse and the U.S. military) became interested in buying the device, if it worked, for sums of half a million dollars or more. Dean's paranoia and insistence upon cash before showing the device, kept interested parties from seeing the device, and Dean never did make any sales.

In 1999, Dean's son, Norman Robert "Bob" Dean, appeared at an anti-gravity conference by invitation of a group of patent holders who had created differing versions of the reactionless drives that referred to N.L. Dean in their patents. He gave a presentation about his father's device. The original drive models, as well as Dean's well-kept and detailed notes, are apparently in the possession of the Dean Family.

The noted science-fiction writer and critic Damon Knight had this to say about the Dean drive in a chapter called "Campbell and His Decade" in his collection of essays about the science-fiction field In Search of Wonder:

> Oh, the Dean Machine, the Dean Machine,
> You put it right in a submarine,
> And it flies so high that it can't be seen—
> The wonderful, wonderful Dean Machine!

Conceptual Issues

One major problem with the Dean patent is that the device simply does not work as described. Some claim that this discrepancy is due to intentional omissions in the technical details of the patent disclosure documents --- a subtle effort to prevent intellectual property theft. Others deny any possibility that this is the case and maintain that the patented device simply doesn't work.

One major argument against the possibility of physically realizing a reactionless drive like the Dean Drive is that such a device could not transfer momentum and thus violates Newtonian physics. New scientific theories such as stochastic electrodynamicsmight eventually provide an

explanation for some mechanisms of momentum transfer not currently encompassed by Newtonian physics.

***Analog* 64(4): 83-106 (June 1960)**

The Space Drive Problem

by

John W. Campbell, Jr

The problem of Space ---- as any daily newspaper will clearly demonstrate --- is not simply a technical problem. It's violently charged with emotional and political tensions.

It may seem, at first thought, that the problem of a space drive is a purely technical problem. It seems clear enough that if we want a mechanism, or principle, by which a vehicle can be propelled in free space --- a device not a rocket, but something acting on the level of force fields, that does not have to carry reaction mass to throw away --- this is a pure, physical science problem.

It isn't. It's a violent emotional problem, first, a red-hot political problem second, and only incidentally a technical problem. Basically, the technical problem is the easiest of the three.

The reasoning behind that statement is quite simple; Nature invariably gives an exact and truthful answer to a properly phrased question, always without fear, prejudice, or dishonesty. The technical problem is simply that of asking Nature the right question.

The other two aspects of the problem do not have the same clear-cut simplicity. Both involve human emotions --- which, as various philosophers have reported over the last six millennia of recorded history, are anything but clear-cut or simple.

In the first palce, the most honorable and ethical of men can be a bald-faced liar, if he's misinformed himself. Even a man so inhumanly honest as to be able to overcome completely any personal emotional bias can still be misinformed.

If you think that there is no emotional problem entailed in the space-drive problem… please thing again, including more the relevant facts. Is it an unemotional problem to a man who has devoted 15 years to rocket-engine research and development? To an executive who has been responsible for authorizing the expenditure of hundreds of millions of the national wealth on the development of launch-pad facilities? Take a careful look at the ads in any this-year's issues of such a magazine as Scientific American… with the thought in mind, 'These men don't know it yet, but a true space drive has already been developed. All this research, all these proposals, are meaningless now'.

Please note carefully: it is not necessary that a space drive has been developed for you to try that little test. Just assume that you did know that one had; the point of that suggested test is to appreciate that the introduction of any true space drive is a red-hot emotional problem.

The buggy-whip manufacturers didn't believe, when the Model T Ford appeared, that their industry was finished. The fact dawned on them only slowly. But gradually they did come to realize that there was no possible improvement in buggy-whip design that could, by brilliant superiority, regain the dwindling market. It wasn't a matter of competition with their product; it was the horse --- without which the buggy-whips had no meaning --- that was innately incompetent to compete.

There is no possible brilliant improvement in rocket design that can make it competitive with a true space drive. The fact is perfectly, and unarguably clear to any rocket engineer. Unlike the buggy-whip manufacturer, who only slowly came to realize that his industry no longer existed, the rocket engineer can see at once that rockets are reduced to a very small-time, hobby or specialized business. If you want to drill a hole a few inches in diameter through 100 feet of hard rock, a rocket --- double-ended type --- is far and away the simplest, cheapest, most portable and quickest technique.

But the space rockets are out completely, if a space drive of any kind is invented.

Of course rocket engineers don't constitute a very great faction in the population --- even in the population of Science. Now I have been told, many times, by many people, frequently with considerable heat, that there is no such thing as Science; there are only human scientists. I don't entirely agree, but we can all agree that there are human scientists. With the specific recognition that there may be Martian scientists, Rigellian scientists, for all we know --- but the only kind of scientists so far encountered are human scientists. They start out as men, not computing machines, and they remain men with a scientific training.

They, too, have emotional problems, biases, prejudices, and powerful desires.

I was asked, recently, to talk to one session of a seminar series at one of the major technical schools. The series was held at night; it's for professionally employed scientists and engineers who are working toward higher degrees. The group is made up largely of chemical engineers; the overall theme is an effort to study the technique of solving problems, rather than education in any specific field.

I was to send in two question-problems for the men to work on; their answers were sent to me to be graded and returned the evening I participated.

The second of the two questions was:

An inventor has patented a device that converts rotary motion to unidirectional motion. And he means just that: unidirectional motion. If driven by a motor, this device produces one-way thrust. It is a bootstraps' lifter. A sky hook with elevator attachment. It makes a monkey's uncle out of Newton's Law of action and reaction.

Now: assume for discussion that the device actually does work (Laws of science have been overthrown before --- even old, established ones!). Many other fundamental principles of modern theory would necessarily change with the fall of the law of action and reaction. What other consequences to fundamental scientific theory would be implied?

One of the answers came from a chemical engineer working in one of the major oil refineries in the New York Metropolitan area. His reaction was:

'The most bitter consequence, if this invention was possible and did work, is this would be a hell of a place to live. The basic laws of centrifugal and centripetal action would not hold. There would be no method of predicting the path of planets through the universe, or of a rocket ship. The laws of fluid flow or mechanical work would not hold. In essence, this is the reason why I do not read science fiction. Scientific curiosity and fantastic experimentation should be encouraged, but pure fiction… This statement was probably made about the work of Leonardo daVinci and Jules Verne, who were forward-looking men of high caliber, but they stayed within the limits of reason. This problem exceeds reason'.

So far as he knew, the question was purely hypothetical; that I had in mind a specific invention he did not know. His reaction was, clearly, emotional, not technical. The emotion stems from the fact that the proposed device attacks on of the fundamental tenets of his world-picture.

Who wants a true space drive, then? Not the rocket engineers! And not the scientists in general, not when it means the destruction of the foundations of their science. If one can't rely on the eternal validity of Newton's Laws of Motion… what stability is there in the world of Science? It's not just a space drive; it's a thing that casts doubt on the validity of the laws of fluid flow, the conservation of energy, the laws of thermodynamics, on everything!

'Better the Devil we know, than the Devil we know not of!'

The space drive is an emotional problem of the highest order, to anyone who has a major emotional investment in any field of science.

Because to be a space drive --- not antigravity, which isn't a drive, but simply something that takes off the parking brake, so to speak --- the device must, in some fashion, negate the Newtonian Laws of motion. It can't drive in space without drastically rearranging the Law of Conservation of Momentum, and the law of action and reaction. And anything that leaks through the Law of Conservation of Momentum automatically challenges the Law of Conservation of Energy. The laws of thermodynamics are based solidly on those; invalidate, or even seriously challenge them, and thermodynamics is a structure without a foundation.

Relativity is based solidly on the conservation of momentum, mass-energy, and electric charge. Any true space drive throws two of the three into doubt.

This is something to make a scientist feel happy and contented?

'Look, who the hell wants that damn space drive, anyway?!'

The political aspects of the problem are more readily stated and accepted as realities. It's not easy for the intellectual man, who believes very sincerely, that his life is entirely rational, to accept or appreciate that he remains a human scientists, and that his reactions are emotional. The politician is different; is business, like that of the dramatist, is largely emotional. He knows he has emotional problems and that only a part of those emotional problems are his own. It perfectly true that schools that flunk out the incompetent, and give special encouragement to the unusually able, are going to do a better job for the nation, but any politician knows the emotional dynamite lying inside that proposition. It isn't his emotion, but it's his to deal with, whether he likes it or not.

A true space drive, just at this point in history, is international political dynamite. Several nations, now, have weapons too powerful for use on Earth; if one of those nations, and only one, also had a drive that gave them free, full, economically practical access to the entire Solar System, the concept of 'massive retaliation' would be invalidated. If nation Alpha has a true space drive, one that can move 10,000 ton space-liners from Earth to mars in three days --- five days if Mars is on the far side of the Sun, or reach the Asteroids in five days, while nation Beta can't get so much as one man-carrying vehicle into orbit… Beta can't talk about 'massive retaliation' as a deterrent any more.

Do you think any sane politician would want a true space drive developed in the laboratories of his country? If the scientists if Alpha develop it, it's practically certain that before a full-scale use of it could be begun, the intelligence agents of Beta would know about it, even if security were so tight that couldn't know it.

And quite clearly no sane politician would dare suggest that the Great Secret was too hot to keep a secret --- suggest that it be freely shared with Beta.

‘Look, dammitall, who wants this space drive now, of all times?’

It’s fairly probable that, if Beta found that Alpha had a true space drive, the Betans would figure their only remaining hope was to force Alpha to her knees before the space drive was developed into use.

Sometimes, somehow, a magnificent ineptitude can solve problems that no wisdom could touch.

I believe the true space drive has been discovered, tested in models, and patented. It’s the most colossal breach of national security I can imagine, just offhand; a true space drive is the well-oiled key to the entire Solar System --- cheap, quick, and practical. If Fermi and Company had, in 1941, gotten a US patent detailing precisely how to purify U-235, how to manufacture Plutonium, and how to make an atomic bomb, it wouldn’t have been a security breach of the same order. After all, as the Air Force pointed out in 1946, the fire raids on Tokyo did more actual damage than the Hiroshima and Nagasaki bombs. Nuclear power is still more expensive than coal. The atomic devices didn’t actually do anything we couldn’t achieve, although in a harder way, without them.

A space drive does things we can’t achieve at all any other way. No rocket can carry enough reaction-mass to maintain a one-G acceleration all the way from here to Mars, or from here to Neptune. Lack of reaction-mass makes it effectively impossible for a rocket to do more than the minutest maneuvers in space. A rocket’s course is about as flexible as a glass rod; it can be bent a little, of course.

Under the concept of national security, publication of the detailed mechanism of a true space drive constitutes an absolutely intolerable breach of secrecy.

Fortunately, magnificent bumbling, combined with emotional rejection of the ideas, have led to the publication and open distribution of the principle.

Frankly, I think that we are most incredibly fortunate; it would have been suicidal for anyone to suggest releasing such a discovery if it had ever gotten under Security --- and almost equally suicidal, I suspect, to try to keep it secret.

Can you imagine anyone proposing to give away the Solar System --- a usable Solar System, when there is a true space drive? --- if it were clear that the invention was precisely that; the key to the full utilization, to the ownership-in-fee-simple, of the Solar System?

Now, it’s happened by bumbling and resistance, of course, there can be screaming, wailing, and explosive accusations… but the critical danger point is passed; it isn’t a secret.

It wasn’t, however, by wise intent that it was released; it was not high-order statesmanship that saved the situation.

The story, in essence, is this:

In the summer of 1956 --- over a year before Sputnik I took off --- Mr Norman L. Dean, of Washington DC, applied for a patent on a device for converting rotary motion to unidirectional motion.

He tried, naturally enough, to interest various government agencies in his discovery. He was still trying in July, 1959, when the patent was finally granted, and the USGPO made it available to everyone for 25 cents and a desire to see it. Dean had also, naturally, applied for British and German patents by that time.

To get from almost any Government building to Mr Dean's residence is s 50 cent taxi ride. Mr Dean has a working demonstrator model at his home; it's been there while various and sundry government agencies didn't look at it.

I drove down from the New York area to take a look; the accompanying photographs show what I saw.

Please consider carefully the following point; it's crucially important, and anyone seeking to evaluate the point of this article misses the thing entirely if he does not bear this in mind:

(1) The foregoing statements about the emotional and political consequences of a space drive are valid, whether Dean's device is such a drive or not.

(2) The failure of any government agent, of any bureau, to inspect the working model, or allow a demonstration of the model, remains a violation of the fundamental doctrine of Science, whether the device works or not.

It is my present belief that Norman Dean has made a major breakthrough discovery; that's a personal opinion, based on observational data, which is more than the government scientists have to back their contrary opinion, but remains an opinion of one individual.

But that no government agency either accepted a demonstration, or bothered to inspect the device, until after the patent was published, and it had been discussed in the December 1959 editorial, is not opinion. It's checkable fact.

The thing Galileo fought for --- the thing for which Science has honored him, classified him as a martyr of Science --- was the fundamental proposition that demonstration must be accepted; that observational date must never be suppressed for the sake of Authority and Theory.

The scientists of NASA specifically violated that fundamental for wich Galileo fought. They wouldn't look.

Neither would the Office of Naval Research.

Neither did anyone from the Senate Space Commmittee. Which is perhaps more remarkable; a Senate Committee that rejected an opportunity to investigate something!

Who is Norman Dean?

Well, the really important thing is that he's a Mr, not a Dr; he doesn't even have a bachelor's degree in science. Obviously incapable of doing any useful scientific thinking. No need to investigate his ideas.

The fact is that he is, professionally, a major executive in the Federal Housing Administration, specializing in mortgage appraisal, indicates that he can, however, do some very cogent thinking indeed.

But in his machine, he is a hobbyist at work --- an amateur. He's so much an amateur that, unlike the professional, he could, and did, challenge the fundamental assumptions of physics. Being an amateur, he does not have any appreciable emotional investment in the validity of Newton's Laws; he had no block against challenging them.

His device --- the patent number is 2,886,976 --- will, when driven by a rotating shaft, produce a thrust without an equal and opposite reaction.

His demonstration model is specifically designed to be just that --- a demonstration model. It's not made for maximum efficiency, lightness, compactness, or beauty; it's designed to be a completely open-work unit, in which every component and operation is clearly visible.

It does not lift itself; it isn't intended to.

At this time, he has no operable models that do lift themselves; he has photographs of models that did. In measuring engineering performance factors, to get necessary engineering data, these models had to be tested to destruction --- and were.

Mr Dean's primary education and experience have been in business; he, with that orientation, is not particularly in the space drive feature. A device capable of producing force without reaction has several million workaday, down-to-Earth uses; the heavy-industry use of the Dean drive will be on Earth. Space applications will be, so far as the economics of the matter go, a minor sideline.

X-rays, electronics, cyclotrons and electron microscopy all stemmed from Faraday's development of the generator, the transformer, and the motor. They have been the great new-fields applications of electric power.

Radio, television and radar --- these are new and wonderful things. But what keeps the powerhouse generators spinning is the heavy horsepower demands of industrial applications like electric heating, driving machine tools, and doing similar jobs that fire or steam power could do… but not as well or as conveniently. It's not the new-and-glamorous that uses the megawatt hours; the biggest broadcasting station throws out only as much power as us used in a domestic electric system. 50 kw sounds big; my home draws 125 amperes at 230 volts on occasion, and that's 28,750 watts.

The heavy-duty use of the Dean drive, as Dean is businessman enough to recognize, is not in glamorous space-exploration --- however important that may be in human history --- but in the slugging, heavy, hard work of the world; simply lifting things that have to be moves; for industrial material-handling devices.

The gadget that can drive a space-drive will be more often needed to lift a massive steel girder into place. With a Dean drive unit on the end of a fishpole-like control rod, a man could lead a 100-ton girder into place.

If you've used an ordinary one-quarter inch drill at all, you have probably run into the problem that the drill was willing to work --- but you couldn't, because of the location, put enough pressure on the bit to make it cut. It's easy enough to make a motor and chuck capable of turning a 2-inch drill bit... but how, with a portable unit, can you apply the sort of pressure it takes to make such a device bite into a steel girder?

The Dean drive is simply a device that generates a one-way force; it lifts if you point up, but it pushes in any desired direction, without need of something to take the reaction force. There isn't any.

Dean's engineering data indicated that, neglecting friction losses --- which are simply a matter of design, not principle, and therefore highly variable --- a 150 hp engine could develop 6000 pound thrust.

My automobile has approximately 400 horsepower, and weighs approximately 5800 pounds. Allowing a 50 percent loss due to mechanical friction, that means that the car could be equipped with a Dean drive, and come up with an acceleration of one G. The passengers would not need seat belts. But rather a strapped-in cocoon. The one-G acceleration would mean going from rest to about 65 mph in 3 seconds flat… and it would, of course, mean braking action that would stop the car, on the slickest of glare ice, in the same 3 seconds, in a distance of about 150 feet. If the passengers weren't cocooned into palce, they'd need hospitalization, however.

By comparison, the maximum possible acceleration with rubber tires on dry concrete is about 0.2 G; the maximum braking is about 0.4 G. That's simply the coefficient of friction of rubber on concrete.

Obviously, the device would also allow airplanes to leave their wings behind; a true hovering machine capable of mach 10 is perfectly feasible.

These, not the space applications, will be the really major applications of the device. We've been needing a portable sky-hook for centuries; it looks like Dean has one.

Dean's demonstration model is intended to show the principle; that a pair of counter-rotating eccentric masses can, in his system, generate a non-reactive force. The simplest way of demonstrating it is to show that some of the weight of his machine goes… somewhere… when it's turned on. The simplest device for showing that is an ordinary bathroom scale. There's no pretense that this is an accurate measuring device; it's intended to establish merely that some considerable force is being generated.

The photographs show that what I saw was not an illusion.

The principle of operation is, of course, what's in dispute. Science holds the device to be a not-member of a non-existent class --- a non-existent class of devices that don't conform to the Law of Conservation of Momentum.

I do not understand Mr Dean's theory very clearly; my personal impression is that he doesn't understand the thing in a theoretical sense, himself. But then --- the Roman engineers never did understand the physical chemistry underlying the setting of mortar (and for that matter, modern physical chemistry doesn't either!). Dean doesn't have to understand it; he can make it work. As a businessman, he has every reason to sell an immensely useful, workable device, whether it's understandable or not --- whether it's rational, or not. That chemical engineering student may be right; perhaps it is beyond reason. A thing doesn't have to be reasonable to be useful.

I believe, however, that a very broad, general explanation of the direction to look for an explanation is possible.

Essentially, the device consists of two counter-rotating masses, on shafts rotating in a light frame. Now such a gimmick has been used to generate a powerful oscillating force in one plane; the horizontal vectors of centrifugal force generated by the two eccentric masses will always be equal and opposite, so that there is no net horizontal force. But the vertical vectors add; with this mechanism alone, Dean would get a powerful up-and-down oscillation, the upward force being equal to the downward force at a later instant. Useful for driving shaker tables for vibration tables, but not for getting anywhere.

Now the great trouble with efforts to make centrifugal force yield a net resultant is that it insists on adding up, through a full 360 degrees, to exactly zero. If you try accelerating the weights at some particular part of their rotation, thus changing the centrifugal force, the force used in accelerating and decelerating them then proves to balance out, very neatly if sadly, the added centrifugal force.

Oh, the centrifugal force is great enough! Centrifugal force can, without any trouble at all, tear a high tensile steel wheel into shreds. In the super-centrifuges, they develop accelerations of 2 million G and more.

The trouble is to make it not add up to zero. What we need is something like a rectifier for alternating electric current; ordinary AC adds up to exactly zero, too, through a full 360 degrees --- but without a rectifier, you can't get DC output.

Dean's device is quite simple; you simply cannot push those weights around to make the centrifugal force come out unbalanced, without using a force equal to and opposite from the added centrifugal force.

But…what happens if, instead of moving the masses, you move the center of rotation?

The center of rotation has no mass; it's a geometrical concept, not a material entity. Pushing it around doesn't require force.

In the rotation of those counter-rotating masses, there is a particular phase angle such that the horizontal vectors are cancelled, and the vertical vector is upward, and exactly equal to the weight of the two masses. At that instant, the light framework can be moved upward without exerting any force on the masses.

In the demonstration model, a small solenoid, activated by a commutator, moves the frame carrying the two masses, at the required instant. It does not have to exert any force whatever on the masses; it does not move them. It moves their centers of rotation.

And what the effect of that is, no modern mathematical analysis is competent to determine. Reason: Dean's converted the problem into a 3-body problem, and that's one that mathematical techniques have never been able to handle.

The two masses, in Dean's machine, are forced to rotate about two different centers of rotation simultaneously.

When Newton did his work, he had, buried in it all, an unstated, and unanalyzed assumption; that there was, of course, one, and only one possible frame of reference.

The whole of Newtonian and Classical physics rests on that assumption; it worked fine until toward the end of the 19th century; in the beginning of the 20th century it was really in trouble.

Einstein correctly spotted, and challenged the assumption, and showed how to handle many unresolvable problems, in terms of multiple frames-of-reference. But… with one underlying catch. Einstein had no mathematical tools competent to analyze more than one relationship at a time; therefore he was forced to simplify the problem of reality by saying 'there is no simultaneity'.

The three-body problem can't be solved, because we have no techniques to handle the simultaneous interactions of A, B, and C. That's why astronomers, trying to compute planetary orbits, have to do it by successive approximations. First figure the orbit of Venus as though only Venus and Sol existed. Then compute the effects of earth-Moon on that orbit. Then correct the assumed earth-Moon orbit for the effects of Venus on it, and then recorrect the orbit of Venus for the perturbed orbit of Earth. Then compute the effect of Mercury, and ---

Our mathematics can handle any two bodies at a time --- any one double-ended relationship.

But it cannot handle simultaneous multiple relationships.

So Einstein said, 'There aren't any'. It was a simplifying assumption which made the problems manageable, and was justified by the great advantage gained thereby.

But Einstein never did like statistical mechanics; the nuclear physicists did, however. In nucleonics, and in solid-state physics, you can't consider one thing at a time; you are forced to consider multiple-simultaneous relationships, the general n-body problem. It can be done if the numbers are large enough, by handling it statistically.

Two counter-rotating brass weights aren't numerous enough for statistical analysis, however.

Actually, our whole present system of physics is, without Dean's help, rapidly approaching a situation where it must acknowledge gross defects. It has, to date, sort of sidled around them, without looking directly at them --- but the situation remains.

It is impossible to express the horsepower output of any reaction engine, either rocket or jet, but let's stick to the pure rocket.

The trouble is, horsepower is defined as work per time-unit. Work, however, is defined as force-through-distance: W = FS. Now consider a rocket delivering a thrust of 1000 units, on a trip from Earth to mars. Its velocity is one mile per second relative to Earth, and ten miles per second relative to mars. What horsepower is the rocket delivering?

Well, of course --- if you consider two different frames of reference, you're bound to get different answers! Einstein showed that…

Yes, but Einstein said you weren't allowed to consider both simultaneously; the real-universe fact is that the rocket does have a relationship to both earth and mars at all times. Just because you don't know enough to be able to comprehend the interaction doesn't make that interaction cease to exist!

Let's go from the matter of horsepower --- which is, after all, a mice, simple, linear function to the matter of kinetic energy. Since kinetic energy is a quadratic function --- KE = 1/2 MV^2 --- that Earth-Mars rocket has another peculiarity. For a given change in velocity, the kinetic energy changes by two very different amounts. If kinetic energy is energy, and energy is conserved… which kinetic energy do we have to be conservative about?

Note that while the greater added kinetic energy appears with respect to the Mars frame of reference, no momentum or energy is being transferred between the ship and Mars at the time. The ship is reacting against its exhaust gases, not Mars. But, if that ship is going to land on Mars, that kinetic energy change must be accounted for at that time.

Which kinetic energy value is conservative: the ship-Earth value, or the ship-Mars value? Einstein's entire theoretical structure breaks down if simultaneity is imposed as a requirement, just as Newton's broke down under the requirement of more than one frame of reference.

What happens to centrifugal force, when, in one cycle, a pair of brass weights is forced to rotate about two non-identical centers of rotation? What amount of force is required to displace a geometrical concept?

When Mr Dean submitted his proposals, a physicist of NASA reported that his mathematics was unsound.

You know, personally I'm inclined to agree with that physicist on one thing; I, too, think Dean's mathematics is unsound. The point of disagreement is that I'm darned sure the physicist's mathematics is incompetent; all mathematics is! I have lots of positive evidence that no one can solve a 3-body problem a bit better than Mr Dean. What Dean has done is present the physicists with a device that imposes a 3-body problem. Their mathematics is just as incompetent to handle it as Dean's --- but Dean isn't trying to solve it mathematically. He's applying it engineeringly, which is somewhat different. His machine solves the problem perfectly --- and the answer is rectified centrifugal force.

Understandably, the emotional impact of the concept that such a device actually exists is one that leads to powerful rejection on the part of any human being with a heavy emotional investment in 'known laws of physics'. It always appears, when one first encounters such a thing, that all the old values have been crushed --- destroyed --- swept away.

They haven't, of course --- except for those who have pinned their entire value system to pure theory. Electronic engineers, computing transit time in ordinary vacuum tubes, don't use Einsteinian concepts; Newtonian work fine, just as they always did, within their proper range.

We've known for a century or more that our mathematics wasn't able to solve the three-body problem; it's perfectly obvious that sooner or later we're going to have to develop a technique of analysis that can handle such problems. And equally clear, that that new technique will, applied to old problems, yield totally new and far more general understandings.

It just happens that, apparently, an amateur experimenter has come up with a device that belongs in the set of devices that would be normal consequences of a multiple-simultaneous-relationship mathematics, before we achieved such an analytical technique.

The theoretical physicists couldn't solve the problems of neutron behavior in a thermal-energy-level moderated nuclear reactor mathematically. That is, obviously, a multiple-simultaneous-relationship problem. To handle the problem, they used what amounts to a rule-of-thumb engineering-style technique; they called it the 'Monte Carlo System'. A roulette wheel proved to be a fine analog computer for the problem.

I think Dean's device is a true space drive; that it does work.

But I know no modern physicist is competent to make a theoretical analysis of any system involving multiple-simultaneous interactions --- and that there are, in the universe, precisely such systems. The number of binary stars is very, very large; there are, also, many trinary star-systems. Can such systems have stable planetary systems?

Since no serious effort has been made to crack the problem, we do not know, actually, whether the energy-interchange relationships in the Solar System are progressive, cyclic, or what. We simply cannot compute the positions of the Solar System either 10 million years ago, or 10 million years hence, by that laborious system of successive approximation.

And even so --- they do those calculations on the assumption that momentum and energy must be conserved. But… which kinetic energy of that Earth-Mars rocket is to be conserved?

The essence of the situation is --- whether modern orthodox physics likes it or not --- that our laws of Conservation of Energy and Momentum are, in fact, very special cases of much more general realities. Newton we already know was fundamentally in error; it is essential, in cosmological physics, to consider more than one frame of reference. Einstein demonstrated that.

But since our laws of conservation stem from Newtonian concepts --- they are suspect anyway, and were before Dean's device came along.

It is already a known fact that our mathematics is incapable of handling the theee-body problem --- or, in general the problem of n simultaneous relationships, where n is greater than one. We can't actually, handle true simultaneous equations; we can 'solve' simultaneous equations only for those points at which they are not simultaneous, but identical --- i.e., the points of intersection.

While I was in Washington taking a careful look at Dean's gadget, I went around to the Senate Space Committee, and to the Office of Naval Research. Both agencies had a file on Mr Dean and his efforts to get some attention paid to his device.

Again I emphasize; it is not important whether Dean is right or wrong; what is important is that the agencies did not find out.

The Space Committee's file apparently shows that the idea was referred to a NASA scientist. His report was that Dean's mathematics was unsound; in other words, Dean's proposal was rejected on the grounds of pure theoretical consideration. That's the same grounds on which the Church Fathers rejected Galileo's proposals, and refused to look through his telescope.

At the Office of naval Research, it was first suggested that I see the national Inventor's Council. This is a government agency set up for the primary purpose of serving as an alley into which to divert screwballs, crackpots, and assorted nuisances. It's very effective; psychologically speaking, it has the stopping power of warm tar. It's too soft to break, and too viscous to move. Remember the famous La Brea tar pits stopped mammoths, saber-toothed tigers, and practically everything else that lived a the time, You can still find embalmed there to this day.

Instead, I went to the ONR department dedicated to evaluation of proposed inventions.

I ran an editorial here recently about an ONR research report, pointing out that the fundamental attitude of the ONR was that theoretical understanding is absolutely necessary before any invention can be made. On direct contact with the ONR inventions evaluations department I found that philosophy dominates their evaluations. If the device or principle cannot be explained in full, clear, acceptable theoretical terms, why, under that philosophy, it doesn't exist as an invention.

A dog can't explain the theoretical enzyme chemistry of digestion; therefore, clearly, a dog can't digest anything.

From the ONR representative to whom I spoke, I gathered that Mr Dean, when he had been told --- by letter --- in a kind but firm manner that his device was mathematically impossible, and that his explanations were unsound, had reacted somewhat irritatedly. This, of course, immediately prejudiced the ONR scientists against him. Clearly, if you tell a man he is wrong, and explain carefully the theoretical facts that prove his invention can't exist, and he gets annoyed --- he having the working model sitting beside him at the time --- this proves that he really is wrong.

There is a widely believed legend --- however it got started I'm sure I don't know --- that only crackpots and fanatics get angry when they're told they are wrong.

It might be helpful if all science students were required to study, as part of their college indoctrination, the papers of Galileo and the Church Fathers who were kindly, but firmly correcting him. Also some of the choicer bits of Newton's and Hooke's remarks concerning the mental competence of their opposers.

As I say, no one from either NASA, or ONR, or the Senate Space Committee bothered to look at the device. It was explained to me that they were all much too busy.

Perhaps it is, actually, fortunate; a true space drive, as a national monopoly, might have precipitated the nuclear war. But if dean is right, the ONR, NASA, and the Senate Space Committee just cooperated in giving away the key to the Solar System…If not to the stars (Einstein's work accepted the laws of conservation; if they are not valid, then perhaps the speed-of-light limitation isn't either).

The important point right now is this: No government agency knows anything at all about whether Dean's device works. They think they do, on the basis of theory --- but there is plenty of reason to suspect that theory is as airtight as a slice of Swiss cheese. That it fits Reality the way plane geometry fits the earth's surface --- only in local areas.

Washington is a fascinating state of mind; it operates purely on the pain-avoidance principle. Animals operate on two fundamental drives --- pain-avoidance and pleasure-seeking. Each

tempers the other; it's a sort of two-party system. Thus a lion will attack a water buffalo, seeking the pleasure of a full meal, despite the fact that the buffalo is an enormously powerful and dangerous animal. The pain-avoidance drive is, in that situation, overcome, or at least greatly modified, by the pleasure-seeking drive, so that the lion will take the risk.

In Washington, there is only the pain-avoidance drive. A bureaucrat who does exactly what his directives specifically require, and absolutely nothing else --- neither more nor less --- avoids the pain of being fired. You can't fire him for failure to accomplish what might have been done; you can fire him only for not doing what his orders require.

Since nobody in any government agency, had specific instructions 'Investigate and evaluate the Dean drive', no one can be fired for not doing what he was not specifically told to do. That means not-investigating it fulfills, 100 percent, the requirement of pain-avoidance.

It's very rarely indeed that someone in government can stick his neck out, and achieve something over and above his assignment. The last notable instance was Admiral Rickover's remarkable achievement of forcing the navy into nuclear propulsion. As is now well known, he very nearly had his career crushed by the high-brass opposition; Congress saves his bacon, not a 'grateful' Navy.

The best-known previous instance, of course, is that of Billy Mitchell --- who was court-martialled for proving he was right, against the orders of his superior officers. That time, Congress didn't act.

Our government has the interesting characteristic of holding --- with great determination --- that monopoly is an evil, and, through the Federal Trade Commission, enforcing competitive situations. But, of course, this doesn't apply to them; government bureaus mustn't be subjected to competition!

Of course, congress and the Senate do have competition; the two-party system is the only method that seems to work. Animal life, in the course of the last four billion years, has tried a lot of systems --- but the two-party technique, known as bisexual reproduction, has overwhelmingly won the race. Male and female constitute the 'loyal opposition'; they are absolutely forced to cooperate, if they want to continue their genetic existence, and yet are so constituted that they cannot possibly fall into identical viewpoints. A man can't think like a woman, nor a woman like a man, no matter how desperately each wants to; they have to work out a binocular viewpoint that integrates two inherently different understandings.

That is the only known, practical technique for assuring that orthodoxy won't set in and crystallize.

It doesn't matter, for this point, whether Dean is right or wrong. It's quite obvious that anyone who did present a true breakthrough concept in terms of a working space drive would be rejected in precisely the manner Dean has been, for precisely the reasons Dean has.

They are precisely the reasons Galileo was rejected.

An Orthodoxy isn't something religious; it 's something associated with a True Faith, whether that faith refers to a religious concept, or a True Belief in certain Laws of nature.

Now Mr Dean is an excellent and successful businessman; he has achieved considerable success financially in his own right. He's got the money it takes to build expensive, carefully machined test models --- and anyone who thinks that's a small-time hobby has never hired a machine shop to do work for him. Models are expensive; just from looking at the photographs of Dean's ex-models --- the ones that had to be tested to destruction to obtain engineering data, since no

modern mathematical technique can handle the problem --- I'd make a wild guesstimate that they must have cost him in the neighborhood of $100,000.

No, they're not big. But a self-lifting job requires six rotor-pairs, with the associated driving gearing, commutators, etc. Try building a little six-cylinder gasoline engine by hand, and see what it costs --- say just duplicate the little Ford Falcon engine in a commercial machine shop. The complete Falcon costs about $2000; think you could hand-tool the engine alone for even twice that?

Dean --- or anyone with a breakthrough idea --- will be stopped by the Orthodoxy effect. But someone like Dean, who is also a darned sight more successful businessman than top-notch physicists --- remember that Einstein had to have help in working out his income tax? --- has economic resources by which he could force a way through to test his ideas. (I've heard, since, from four other men who had ideas closely paralleling Dean's but didn't have the money to build and test models). As Dean said, 'If they continue to refuse to pay attention, I can, and will, build a full-scale vehicle, and hover over Washington until they do'.

(Side comment on that: he'll probably be forced down, and arrested for violating a restricted air space, while his vehicle is impounded where no one can get at it. If he goes up to an altitude where they can't see him, they won't mind; who'll see it 100 miles up?

Now what Dean has, is not anti-gravity; it's a drive.

Anyone here want to make any large-size bets that the secret of anti-gravity hasn't already been cracked by some backwoods unorthodox amateur --- who isn't, as Dean is, a highly competent business man as well? How many individuals can afford $100,000 worth of private test-model building?

There are other fields of science where things are under even 'better' monopoly control; the physical scientists do not very frequently run onto a brilliant amateur with more money than they have. But the medical society has things sewed up even tighter; the brilliant amateur with money can be stopped legally from demonstrating his achievement.

Russia has out-achieved the United States so far in the development of new techniques. Furiously as the intellectual-scientists despise the system whereby politicians can legislate for or against scientific beliefs --- the Lysenko controversy, for example --- the wry fact is that it has produced some results. It took action by Congress to get Admiral Rickover off the hook; the problem of whether or not nuclear propulsion should be used in the navy was a technical-scientific problem --- and it was resolved in favor of the United States only by legislative action.

The probability that ONR or NASA will, at this late date, willingly accept the Dean device for actual test and study, is vanishingly small. If they do so, it will constitute an admission that it merits testing --- and, of course, it is then acknowledged that it should have been tested in the summer of 1956. (NASA is off that hook, of course; they didn't exist in 1956. But they have been around for some time now --- and existed before the patent was publicly issued)

Again, it's going to take a legislative act, not a scientific act, to get the device tested. The scientific groups are forced to maintain 'Testing is not, and never was, within the limits of our directive; you can't say we're responsible for trying it'.

Because Russia's scientific system is new --- effectively only about 20 years old --- it hasn't had time to establish a solid orthodoxy. Therefore it gets nudged --- but good and solidly! --- every so often, and gets things done, however unhappily.

We don't. Our satellite program, for instance, the Vanguard Project, not only turned out to be a 'Me Too' project --- it never did succeed in doing what the Navy said they were going to do. Not one full-scale Vanguard satellite was put up in orbit during the International Geophysical year; they never did accomplish what they had loudly and publicly stated they would do.

We got satellites up only after public and legislative --- not scientific! --- howls of anger at Russia's success.

But this time I think the Orthodox Science system has flopped so egregiously --- pulled so screaming a boner --- that something may be done.

By sheer Orthodoxy refusal to consider the possibility that their theory might be inadequate --- they never found out about the Dean drive.

Our cover shows what could have been done --- and still can be done, for that matter.

A modern nuclear-powered submarine needs only relatively minor adaptations to make an ideal spaceship; it has everything it needs, save for the space drive.

The Dean drive requires a rotary shaft drive; our nuclear submarines turn nuclear energy into heat, produce steam, drive a turbine, and generate electric power. Electric power is perfect for running the Dean drive.

The modern submarines are --- we have learned from past sad experience --- equipped with lifting eyes so that, in event of accidental collision, quick salvage is possible. Pontoons can be towed in place, sunk beside the ship, and hitched to the built-in lifting eyes, and the ship refloated. The eyes are, of course, designed into the ship so that the structure can be lifted by those eyes without structural damage to the hull.

Dean drive units could be attached directly to the existent eyes.

The pressure hull of modern submarines is designed to resist at least 600 feet of water pressure; its actual thickness is a piece of classified data, of course, but we can guesstimate it must be at least 4 inches thick. After the second Bikini bomb test, the old submarine Skate was still in pretty fair condition; the light-metal streamlining hull looked like the remains of an airliner crash, but the pressure hull was perfectly intact. Stout stuff, a sub's pressure hull.

And very fine stuff indeed as protection against the average meteor; the light streamlining hull would stop the micrometeors, of course.

Not even 4 feet of steel would stop primary cosmic rays, of course… but those inches of armor steel would have considerable damping effect on the Van Allen radiation belt effects.

The nuclear subs have already been tested with full crews for 30 continuous days out of contact with Earth's atmosphere; their air-recycling equipment is already in place, and functions perfectly. What difference if the 'out of contact' situation involves submersion in water, instead of out in space?

The modern nuclear submarine is, in fact, a fully competent space-vehicle, lacking only the Dean drive.

With the Dean drive, the ship, if it can lift off the Earth at all, can generate a one-G vertical acceleration. Since that acceleration is being generated by engines capable of continuous operation for months --- if not years --- at a time, the acceleration can simply be maintained for the entire run; there would be no period of free-fall for the ship or crew. Therefore the present ship structure, equipment, and auxiliary designs would be entirely satisfactory. Also, a sub has

various plumbing devices with built-in locks so the equipment can be used under conditions where the external pressure is widely different from the internal.

In flight, the ship would simply lift out of the sea, rise vertically, maintaining a constant 1000 cm/sec drive. Halfway to Mars, it would loop its course, and decelerate the rest of the way at the same rate. To the passengers, and to the equipment on board, there would be no free-flight problems.

There is one factor that has to be taken in to account, however; the exhaust steam from the turbine has to be recondensed and returned to the boiler. In the sea, seawater is used to cool the condenser; in space, the cold vacuum would do the job.

The tough part would be the first 100 miles up from the Earth; ice could be used.

As a crash program, this could have been done --- if work started when Dean first applied for his patent --- in 15 months. The application went in in July 1956; 15 months later would have been October 1957.

Under the acceleration conditions described above, a ship can make the trip from Earth to mars, when Mars is closest, in less than three days. And even when Mars is at its farthest possible point, on the far side of the Sun, the trip would only take 5 days.

It would have been nice if, in response to Sputnik I, the US had been able to release full photographic evidence of Mars Base I.

I do not insist that I am incontrovertibly right, but it is my opinion --- based on observational data that the US government has avoided acquiring --- that we actually had everything necessary to do just that. We certainly had the nuclear subs to use --- and I believe the Dean drive can do it.

Even more important, now that we've given away the Solar System, is the fact that the fundamental principle underlying Dean's device is fundamental. It's not just the key to a space drive; the principle of simultaneous multiple relationships is enormously broader than that.

The psychologists have complained that there was no mathematical technique for their work. Quite so; they too, obviously need a math capable of expressing multiple simultaneous relationships.

No electronic device can recognize a pattern; that's why no machine can be made to recognize words spoken by widely varying voices. A pattern exists where there is multiple simultaneous relationship.

It is the inherent nature of any orthodoxy to freeze at the level it has achieved, developing only the ramifications and details of that level. The dinosaurs developed a million variations on the theme dinosaurism… but none of those variations was mammalianism.

The question really is: How can orthodoxy in Science be ended? Of course, we can have acts of legislative bodies impose new ideas by fiat --- the system we've been using recently, and that the Soviets use. It isn't good; it's just better than none.

Life forms solved it quite some megayears ago; they use the two-party system. We've found that works in political systems, and in religious systems. (Religion hasn't been harmed by having Catholic and Protestant Christian churches, though it took some bloodshed and Violence to put over the idea)

Perhaps we could make a lot better and faster progress if Science and Engineering were recognized and established as distinct, and --- by legislative fiat at first --- made two separate and distinct parties. Who can better criticize a Scientist's theory, than an Engineer who tries to make

the thing work? And who can better criticize an Engineer's efficiency than a Scientist, who analyzes with exact precision what it is the Engineer is really doing --- and not what he thinks he's doing?

The scientists, in Edison's day, had mathematical proof that the maximum possible efficiency of an electric generator was 50 percent. They still had the mathematics after Edison started manufacturing 98 percent efficient generators.

You know, there's nothing like a good Republican to spot a Democratic grafter --- or a good Democrat to expose the incompetence of a Republican. And everybody benefits except the incompetent and dishonest individuals.

Look, don't we believe in the fundamental validity of two-party competition? Then what's wrong with a two-party Science, to permanently terminate the freeze effect of orthodoxy?

US Patent # 2,886,976

System for Converting Rotary Motion into Unidirectional Motion

19 May 1959
(Cl. 74-112)

This invention relates to driving systems for producing unidirectional motion and it has for its primary object to provide a propulsion system in which a rotational movement produced by a prime mover is converted into a continuous or intermittent unidirectional movement of a load carrier which may or note be the carrier of the rotational elements of the system.

Devices using freely suspended rotating eccentric inertia masses are known which produce an oscillatory movement of the carrier of the rotating inertia masses. This oscillating movement is obtained by limiting the degrees of freedom of the freely suspended eccentric rotating inertia mass or masses to such an extent that movement can only occur in substantial parallelism to one plane. Such a limitation of the degrees of freedom of movement of the freely suspended rotary inertia mass or masses may be produced in several different ways.

One of the methods of limiting the degrees of freedom of such a system consists in providing a pair or pairs of eccentric rotating inertia masses, rotating in opposite direction about parallel linear axes which are rigidly connected. This rigid connection between the shafts rotating the eccentric inertia masses, the axes of which form the axis of rotation of the masses, and the rotation of the said eccentric masses in opposite directions produce a cancellation of the forces and reactions engendered in all directions except in the direction parallel to a plane at right angles to the axes of rotation of the rotating masses. The result of this cancellation is an oscillation of the system at right angles to the axes of rotation produced by the resultant forces which represent the sum of the components of all the forces acting in this direction, engendered by the rotation of the masses. It will be clear that a freely suspended oscillating system of this type is not subjected to any other reaction or force.

Devices of this type have been constructed for imparting oscillatory movement to some member or load device either for testing purposes or for the purpose of producing a regular vibration.

My invention essentially consists in providing a system of the type above described in which an oscillatory movement of a freely suspended inertia mass or of a plurality of such masses is produced by the rotation of a mass or masses around an axis or axes and by limiting the degrees of freedom of movement of said freely suspended mass or masses, and in which the oscillatory movement of the system produces a continuous series of unidirectional impulses which may be transmitted to a suitable load device or which may act on the carrier of the system itself, without

however reacting on or otherwise influencing the frequency or amplitude of the said oscillatory movement.

The system is thus distinguished from a system of transmission of energy of motion to an exterior mechanism or system which produces a reaction between the said systems or mechanisms, by damping the oscillations.

While preferably pairs of eccentric inertia masses rotating about parallel axes in opposite directions are used in such a system it will be clear that the oscillatory movement of the system may also be produced by other means, for instance by guides or guide channels limiting the movement of a freely suspended shaft which rotates an eccentric inertia mass at high speed.

The principle of the invention may be best understood by referring to the oscillatory movement produced by a freely suspended eccentric inertia mass guided along a linear guide channel or by pairs of such freely suspended eccentric inertia masses of identical weight rotating about parallel linear axes in opposite directions. Any point of the system located in the plane of symmetry passing through the guide channel or located in a plane of symmetry passing between the axes of rotation of the freely suspended weights will oscillate within this plane in a direction which is parallel to the guide channel or which is at right angles to the plane passing through the parallel axes of rotation. This oscillation occurs around a central position. If a load is imposed during the oscillation of the system in the central position in such a manner that only movement in one direction will act on and move the load, for instance if the oscillation takes place in a vertical plane and if a weight is so placed that the oscillating system comes into contact with the said weight in the central position, it will be clear that the weight will be lifted during the upwardly directed stroke and that this lifting of the weight will shorten the normal elongation of the system.

However, on account of the free suspension of the rotating masses and their shafts the amplitude of the oscillation during the back swing of the system is not affected or changed thereby as the centrifugal and other forces which cause the oscillation of the system remain unchanged. All points of the system thus will swing back first to a new central position and from there to a position corresponding to a full normal amplitude of the oscillation and the elongation with respect to the new central position of the back swing will be the same as it would have been if the weight had not been applied. The system thus reaches a new position at the end of the back swing in which its distance from the position of the weight (originally applied in the central position) is again equal to the full amplitude.

The following vertical upswing therefore would only move the system to such an extent that it would just come into contact with the weight applied in its extreme position, but this upwardly directed swing would not move the weight which has been applied anymore.

To produce a lifting of the weight it is therefore necessary to displace or shift the system by suitable means so as to bring it back into its original position. This movement must be performed by means of external forces acting on the system, but these external forces need not overcome a high resistance if the proper moment is chosen for this movement. When the shifting of the system is performed at the time when the resultant of the forces producing the oscillation is either zero or points in the direction in which the system is moved, only the inertia of the carrier and shafts has to be overcome which, if these members are sufficiently light in weight, is practically insignificant.

By moving the system in this way by the external forces towards a load, the load may be lifted intermittently but continually. Instead of moving a load directly, a coupling may be applied to an element coupling the system at the proper moment to an exterior member while uncoupling the

system during its back swing and during the shifting. In this way a series of unidirectional impulses may be transmitted to the said member.

It will also be clear that the system may be moved along a fixed member.

The principle of the invention thus consists in converting the energy of an oscillatory movement of a system, consisting either of a freely suspended, rotary eccentric, inertia mass guided along a linear guide, or of pairs of freely suspended rotary eccentric inertia masses rotating in opposite directions around parallel axes of rotation, into unidirectional impulses applied to a load, preferably by a cyclical coupling of the system with a load accompanied by cyclic coupling of the system with a load accompanied by cyclic shifting of the system. This principle is preferably applied by producing a coupling of the system with the load device during that phase of the oscillation during which the latter and the forces producing it have a direction which coincides with the desired direction of movement or of application of the impulses, and by producing the shifting of the system at the time at which the said forces are approximately zero so that a minimum resistance will be offered to such shifting.

The main object of the invention therefore consists in providing a driving system including a freely suspended rotary inertia mass which by suitably limiting the degrees of freedom of its movement produces an oscillatory movement of the system of a definite frequency and amplitude, which driving system periodically transmits unidirectional impulses to a load device without producing a reaction on the frequency and amplitude of the oscillation of the system.

A further main object of the invention consists in providing an oscillating system, the oscillation of which is maintained at a definite frequency and amplitude by means of pairs of freely suspended inertia masses, rotating at the same speed but in opposite direction about parallel axes with respect to which they are eccentrically mounted, said system supplying energy to a load system cyclically and unidirectionally during one phase of each oscillation, while said system is cyclically shifted by external forces after each impulse during a predetermined phase of the oscillation of the system.

A further main object of the invention consists in providing an oscillating system, the oscillation of which is maintained at a definite frequency and amplitude by means of pairs of freely suspended inertia masses, rotating at the same speed but in opposite directions about parallel axes with respect to which they are eccentrically mounted, said system supplying energy to a load system cyclically and unidirectionally during one phase of each oscillation, while said system is cyclically shifted by external forces after each impulse during a predetermined phase of the oscillation during which the resistance of the system against displacement is at a minimum.

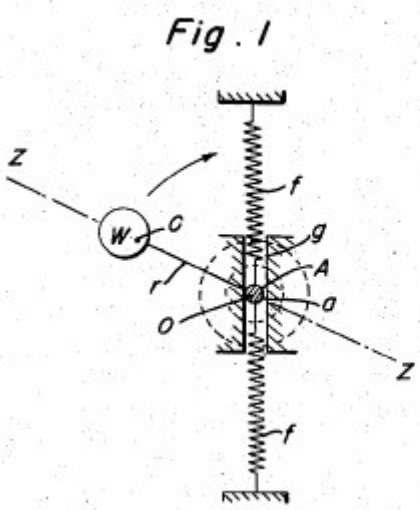
The further objects of the invention will be more clearly understood when referring to the following specification.

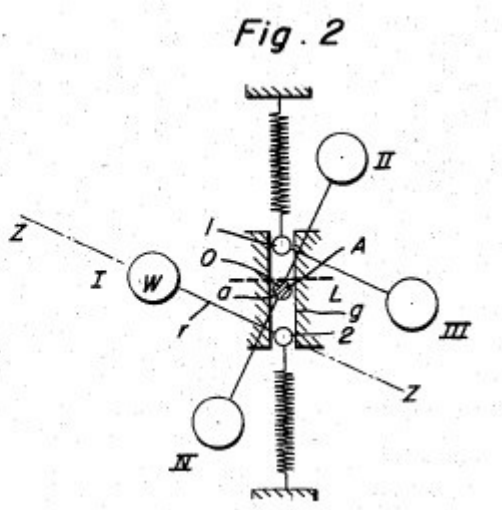
The invention is illustrated diagrammatically in the accompanying drawings by way of example. The diagrams illustrate only the principle of the invention and one mode of applying said principle. It is however to be understood that the purely diagrammatic showing does not offer a survey of possible constructions and a departure from the constructional features diagrammatically illustrated does not necessarily imply a departure from the principle of the invention.

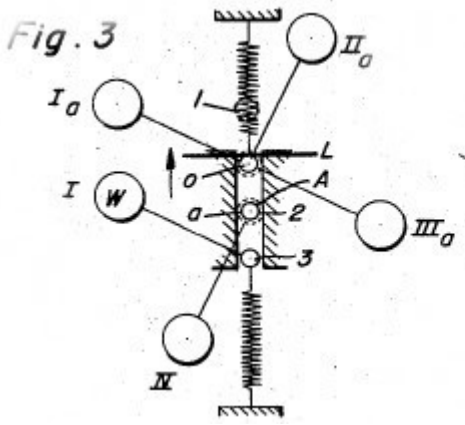
In the drawings:

Figures 1, 2, and 3 are diagrams illustrating the restriction of the movement and the various positions of a freely suspended rotating mass during one revolution, Figure 2 illustrating the

positions without application of a load and Figure 3 illustrating the positions adopted during one revolution when a load assumed to stay in a fixed position is applied.







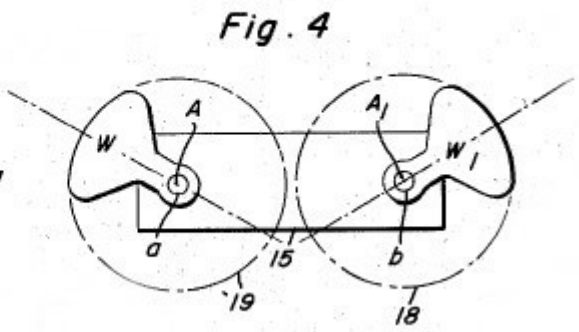


Figure 4 is a diagram illustrating the restriction of movement produced in a system using pairs of masses rotating around parallel shafts in opposite direction.

Figure 5 is a diagram illustrating in particular the general arrangement of the system.

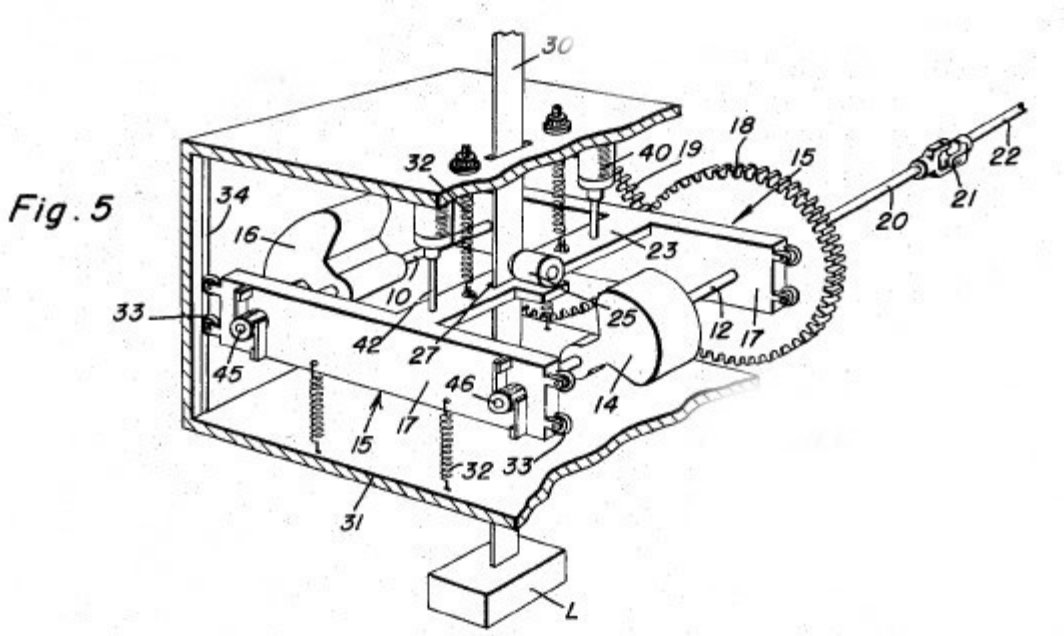


Figure 6 is a diagram illustrating in particular the general arrangement of the system diagrammatically illustrated in Figure 5.

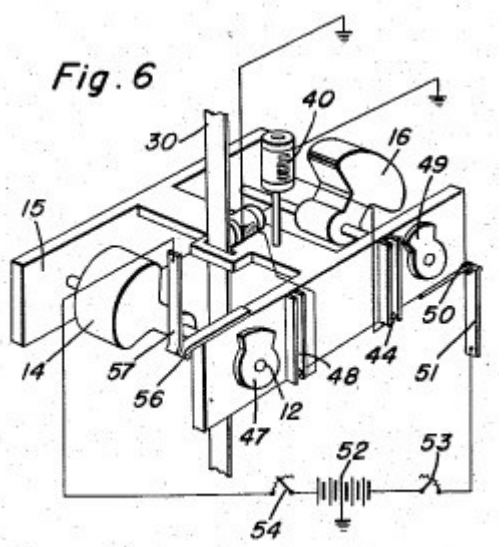
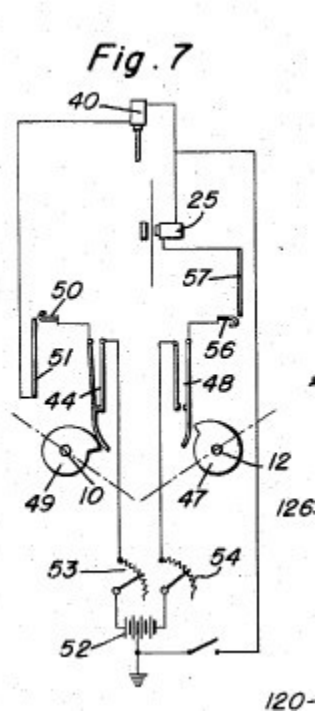
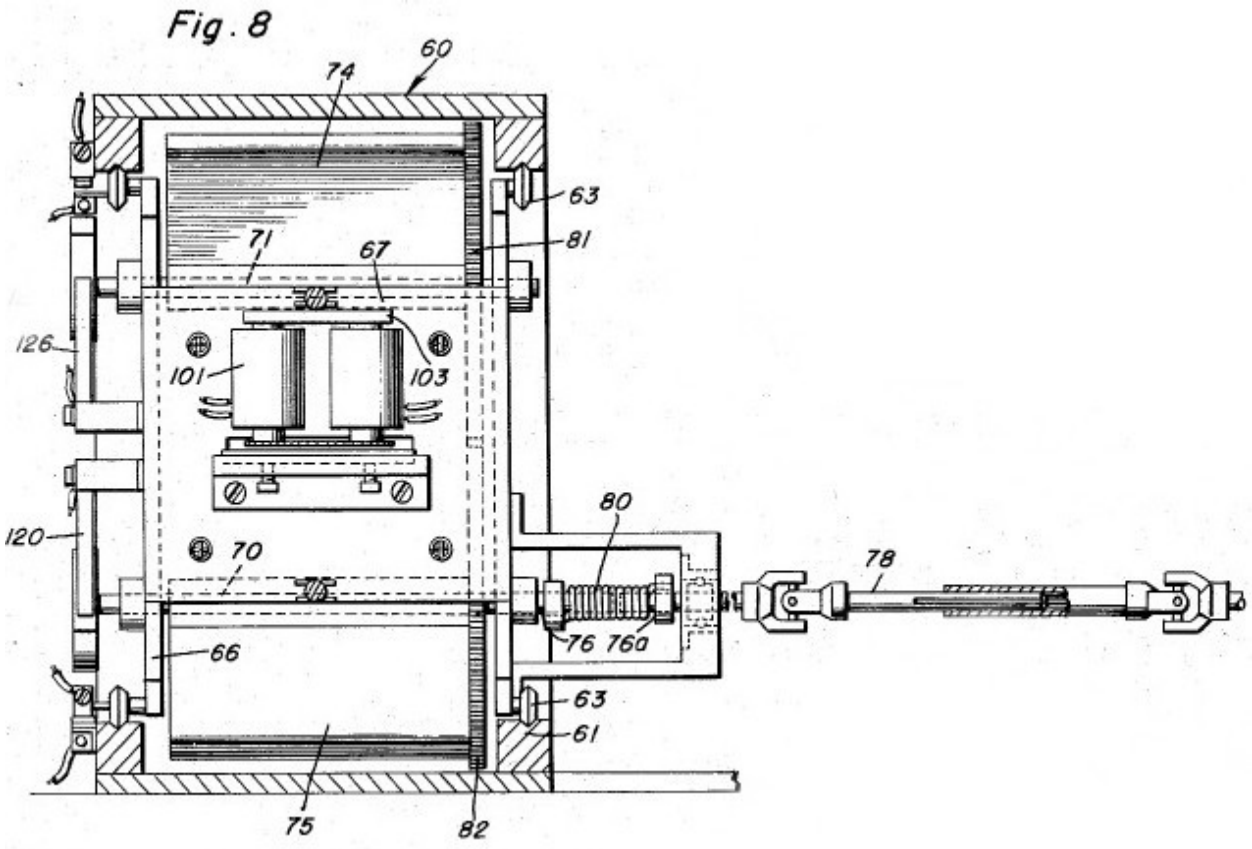


Figure 7 is a diagram of the connections of the control system illustrated in Figure 6.



Figures 8 and 9 are diagrammatic elevational side views at right angles to each other of an embodiment of the invention in which a tape to which a load is attached is moved horizontally.



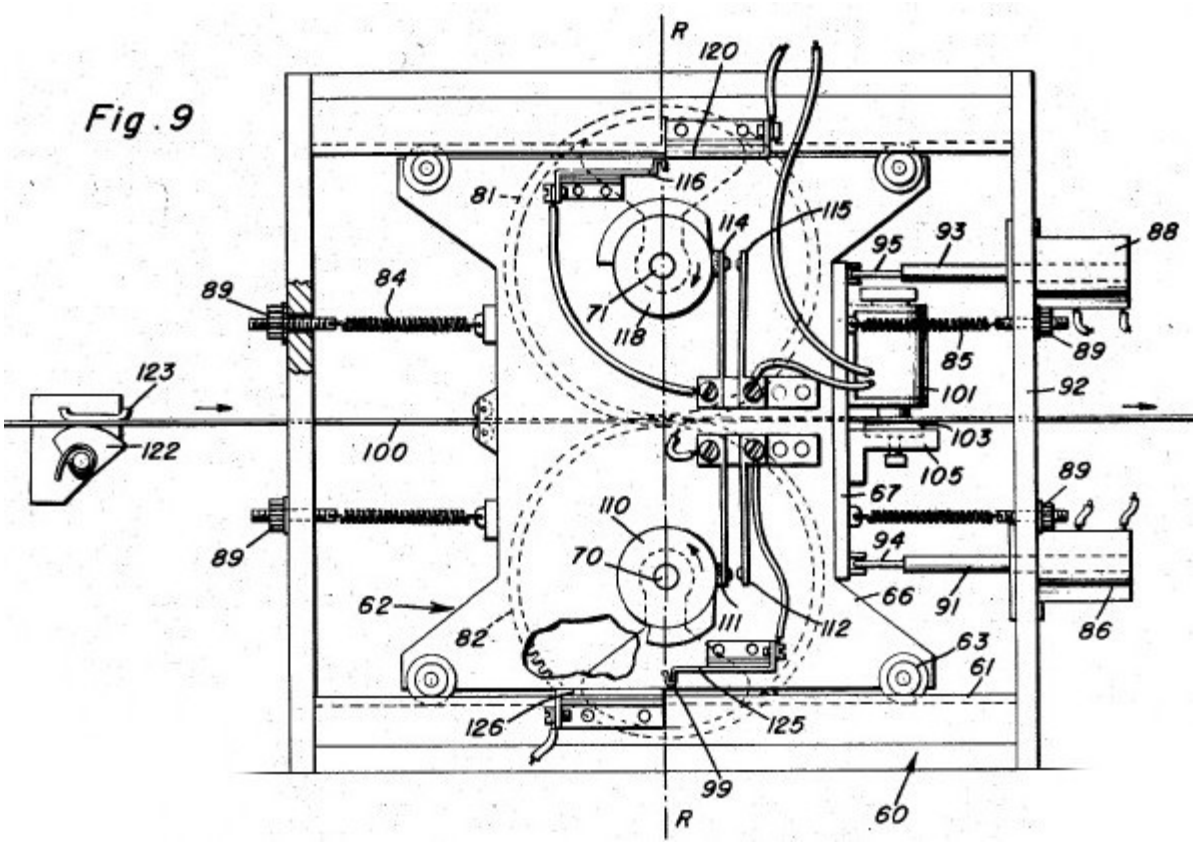


Figure 10 is a diagrammatic plan view of the same embodiment.

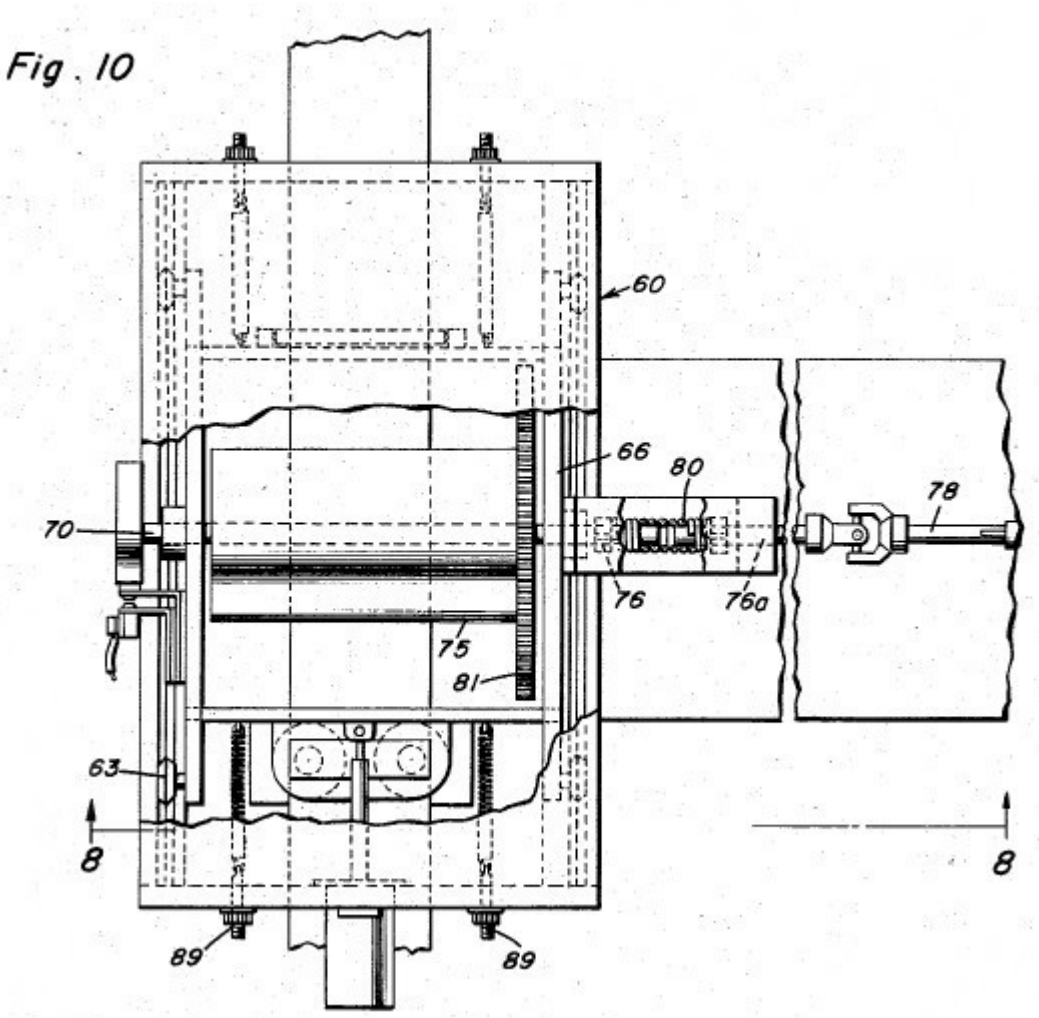


Figure 11 is a diagram showing the cooperation of a plurality of units.

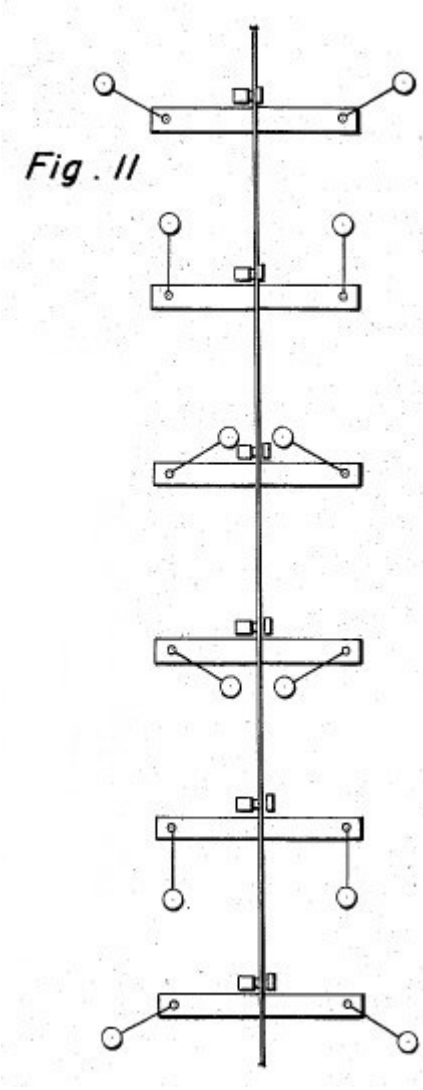
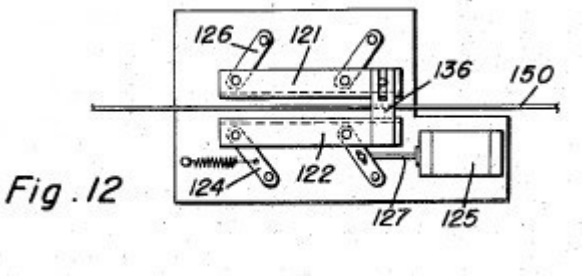


Figure 12 is a diagram of an electromagnetically operated mechanical clutch.



The principle on which the invention is based will be best understood by referring to Figures 1 to 4. A rotating mass or weight W with center of gravity C which is eccentric with respect to the axis of rotation A and which is rotated by a shaft a is freely suspended, for instance, between suspension springs f. A rotation of the weight W around a shaft a will produce a gyratory movement of the system, the axis of rotation A describing a circle. If this movement as shown in Figure 1 is restrained so that the shaft a may only move between the two fixed guides g the

movement of the freely suspended shaft a becomes an oscillatory movement within the guide channel g in a plane which is parallel to the said guides. This oscillation takes place around the center 0 through which the axis of rotation A passes during the oscillation.

As explained below in connection with Figure 4, the guides g my be replaced by an arrangement comprising two shafts a, b carrying two identical eccentrically mounted weights W, W1 and rotating in opposite directions around their respective axes of rotation A and A1. If these shafts a, b are held for rotation within members rigidly connecting them, these member will take up the forces and reactions engendered between them and as, on account of the opposite direction of rotation of the eccentric weights, these forces and reactions are opposed to each other and neutralize each other, this will produce exactly the same effect as that produced by the guides g and only forces or reactions at right angles to the plane passing through the axis of rotation can manifest themselves.

Oscillating arrangements of this type are known and have been used for producing an oscillatory movement in one plane. The special problem dealt with by my invention, however, consists in transforming this arrangement into a source of unidirectional power, producing unidirectional impulses which may be transmitted to any lifting or propelling device and which thus may be used for the lifting or propelling of a load or the lifting or propelling of a load or the lifting or propelling device and which thus may be used for the lifting or propelling of the lifting of a load or the lifting or propelling of the unit on which the system is mounted.

Referring now to the diagrams Figures 2 and 3 in which a pair of rotating weights is again replaced by a single rotating mass W guided between fixed straight guides g and in which the free suspension of the shaft a is again indicated by means of springs f, it will be seen that, upon rotation of the eccentric mass W the shafts a, if freely suspended, will oscillate between the positions 1 and 2. During these oscillations the weight W and the arms r will occupy the positions indicated at I, II, III and IV. If now a load L is imposed on the shaft a whenever it reaches the central position 0 of the oscillation the load will be moved during that phase of the oscillation during which the sum of the resultants of the driving couples and centrifugal forces and of their reactions have components in the desired direction which is hereinafter termed the positive direction. It will be clear that this occurs during the positive portion of the cycle.

In the diagram Figure 3 it is now assumed that the load L is not moved but that merely pressure is exercised by the shaft a on the load during the positive portion of the cycle. A continuous series of impulses can, however, not be maintained with this arrangement when left to itself. While, as long as the weight W remains on the positive portion of the cycle (between positions Ia and IIIa) in which the resultant of the forces is directed toward said load L, an impulse can be produced which is upwardly directed in the diagram, the negative phase of the cycle (positions IIIa, IV, I) which now starts from point) will produce a back swing covering the full amplitude so that the shaft a at the point of maximum elongation will be in position 3. The center 0 the oscillation is thus shifted to the position 2 and the next positive cycle, starting at position 3 would bring the shaft a just back to the load L but would not produce any further impulse on the load L.

Therefore, as indicated in the diagram Figure 3, a system for producing continually impulses in one direction on the load L must include means for shifting the system, and especially the shaft a, towards the load. This additional shifting is preferably performed when the rotating weight W has reached position I which is a zero position in which the resultant of all forces and reactions is approximately zero. Shifting may also occur in a position in the vicinity of position I in which

the resultant of the forces and the reactions start to point in the positive direction which is also the direction of the shift.

The resistance of the system against shifting will then be small and will not include the inertia of W but solely the mass of the shaft and frame which parts should be made as light as possible, a requirement which is also to be considered as being of advantage from many other viewpoints. The shaft and frame being as light as possible relatively to the weight W will also reduce the reaction of the system formed by the weight W the arm r, and the shaft a, developing in the center of rotation A.

The shifting of the shaft a will bring the system back into the original position relatively ro the load L and therefore the second cycle now starting after the shift will again produce an impulse on the load L in the selected direction.

The shifting movement may be produced by means of a solenoid or by a set of solenoids indicated at 40 in Figure 5 which solenoids will be energized at a predetermined p[oint (position I in Figure 3) which movement produced by the solenoid brings the system into the position Ia with shaft a in the point 0.

It has been assumed, for the purpose of explanation, that a series of impulses has to be applied to a stationary load. However, in the majority of practical applications a continuous though intermittent advance of the load in a given direction has to be produced by the impulses delivered by the system. Therefore, the system, after shifting, is coupled with the load and has to be released or uncoupled when the impulses have been delivered for a free back swing. A gravitational load held against back movement may be advanced without such a coupling if the system acts in a vertical direction as indicated in Figures 1 to 3. However, in most cases a coupling of the system, delivering the impulses to the load device, will be necessary which coupling may be produced either by a mechanical coupling or clutch, for instance a clutch with eccentric jaws and gripping automatically a member such as a tape, cord or cable attached to the load whenever the system is moved in one direction, while releasing this grip when the system is moved in the opposite direction, or by means of a magnetic clutch operating by means of electromagnets. The electromagnets may operate the jaws of a clutch or may directly cooperate with the steel tape.

The electromagnets of the clutch are energized during that portion of the cycle during which the load is imposed on the system and the impulses are delivered to it. When this phase has passed the electromagnets are de-energized thus uncoupling the impulse delivering system from the load device. Obviously the load supporting means or steel tape must be held by a mechanical or magnetic locking device during the period during which the impulse delivering system is uncoupled.

It will be noted that the shifting of the impulse delivering system and the coupling of said system with the load device directly succeed each other, they both occur in succession at the start of the positive phase of the cycle.

Further, it maybe noted that while the impulse delivering system and the coupling of said system with the load device directly succeed each other, they both occur in succession at the start of the positive phase of the cycle.

Further, it may be noted that while the impulse delivering system does not have a fixed position in space with respect to a reference system, the movement shifting the system may be utilized to bring it always back to the fixed position with respect to a predetermined reference system R-R as indicated diagrammatically in Figure 9.

Referring now to the diagram shown in Figure 5 in order to explain the basic construction and operation of the device according to the invention it will be seen that two rotatable shafts 10, 12 are journaled within a freely suspended movable framework 15. On each shaft a weight 14, 16 is secured eccentrically and is rotated by the shaft at high speed. Each shaft may carry a gear wheel 18, 19. the two gear wheels may mesh and one of the shafts 12 may be provided with an extension 20 which by means of a universal joint 21 connecting it with an intermediate shaft 22 may be driven by means of a drive motor. The two eccentric weights 14 and 16 rotate at the same speed in opposite directions. The intermediate shaft 22 may be joined to the shaft of the drive motor by means of a second universal joint shown in Figure 8 to provide free movement and adjustability and the said intermediate shaft in addition may consist of two splined portions which two shaft portions may therefore move relatively to each other in a longitudinal direction.

The frame 15 consists of two side plates 17 which may be joined by a transverse bridge member 23 carrying the magnetic clutch 25 which, in the example illustrated, acts on a steel tape 30 passing centrally through the said bridge piece, slots 27 being provided wit rollers, wheels or balls 33 running on tracks fixed in the outer frame 31 to permit an oscillatory movement of the inner frame wit the smallest possible friction.

To produce the shifting movement of the frame 15 which has been explained above two solenoids 40 are arranged which are mounted on the outer frame 31, the retractable cores of which may be provided with extensions forming lifting rods 42 attached to the transverse or bridge piece 23 of the movable framework 15. When the solenoids are energized, the frame 15 after having made its back swing is thus lifted and is brought into the desired position relatively to the outer frame and the load.

As above explained the energization of the solenoids 40 as well as the energization of the clutch electromagnets 25 must be exactly times in order to produce a smooth functioning of the device. The clutch electromagnet 25 must be energized during that phase of the cycle during which the resultant of the centrifugal forces and reactions produce suitably directed or positive resultants, for instance an upwardly directed resultant in Figure 5, while the solenoids 40 must be operated during the start of the positive phase of movement following the greatest negative elongation.

To produce this precisely timed operation suitable control means are provided for controlling the energization of the electromagnetic devices. These means are illustrated especially in the diagrams in Figure 6 and 7.

In the example shown in Figure 5 each of these means consists of a rotating commutator or contact device cooperating with suitable brushes or contact springs and in sliding contact devices such as illustrated in Figure 6 by way of example.

Rotating commutators 45, 46 associated with the shafts 10 and 12 are provided in order to produce an operation which is in exact conformity with the position of the weights 14, 16 and with the forces generated thereby.

The slide contacts, on the other hand, are provided in order to produce energization of the said magnets only in predetermined spatial positions of the movable framework 15 relatively to a point or plane of reference which may be fixed on the frame and also to produce the successive timing of the energization.

As seen in Figure 3 the solenoid must be energized in a position of the shaft a in which the back swing of the oscillation has been performed and in which the system starts again to move in the direction towards the load. This phase of the movement is reached when the weights W on the shaft a reach the position marked I in Figure 3.

The clutch magnets 25, however, are operated when, after shifting of the position of the framework by means of the solenoid 40 the weights start to move in the positive cycle. The clutch magnets therefore remain energized as long as the weights move through this portion of the cycle.

In Figure 6, illustrating the control and contact device diagrammatically, the commutators which usually consist of a drum with conducting and non-conducting surfaces cooperating with a brush, are shown for the sake of better illustration in the shape of cams pressing contact springs, which springs control the circuits of the solenoids and of the clutch electromagnets. The commutators, as will be clear, make and break the circuit in exact conformity with the position of the weights 15, 16, the contact springs 44 being closed by cam 49 the moment in which the weights 14, 16 reach approximately the zero position (position indicated by dots and dashes at z-z in Figures 1 and 2) and the commutator segments or cam surfaces are arranged correspondingly.

A commutator 48, 47 controlling the solenoids is likewise operated in a definite position of the weights 14, 16 close to position I in Figure 2 and the cams 47 and contact springs 48 are arranged accordingly.

The commutator devices are preferably finely adjustable as they determine the starting point of the cycle and also the duration of the impulses. Energization and de-energization of the solenoids, in addition to being timed relatively to the cyclical position of the weights must also occur in a certain well-defined position of the frame 15 relatively to a reference system. This is of special importance as a part of a movement of the framework 15 is an oscillation which is only opposed by springs. As small differences of elongation and a high number of revolutions may lead to quite substantial deviations if not corrected, a reference contact device, formed by a slide contact, controlling the position of the frame, is arranged correcting the deviations and bringing the framework always precisely into a fixed spatial position relatively to the fixed frame and its reference system.

For this purpose the framework is provided with a slide contact 50 cooperating with a fixed contact 51 arranged on or near the fixed frame. The energizing circuit of the solenoids includes these contacts so that energizing and de-energizing will only occur if the correct succession of the energization of this magnet and of the solenoids in a definite position of the framework. This slide contact device is indicated at 56 and 57 in Figure 6.

Figure 7 shows the circuit connection of the device illustrated in Figure 6. As seen in this figure the circuit of the solenoids includes the source of current indicated at 52 and an adjustable resistance 53, as well as the contact springs 44 controlled by cam 49 on shaft 10, the slide contact 50 carried by the frame 15 and the fixed slide contact 51.

The circuit of the coupling magnet 25 includes the same source of current 52, the adjustable resistance 54, the contact springs 48 controlled by the cam 47 on shaft 12, the slide contact 56 on the frame and the fixed side contact 57.

It will be noted that the position of the weights by means of the cams control the two circuits. In addition the slide contacts 56, 57 and 50, 51 permit energization of the solenoid 40 and coupling magnets only in sequence, as slide contact 50 leaves slide contact 51. Moreover energization of the solenoid does not occur of during the oscillation of the frame, the contact 50 should overrun contact 51, but occurs only when both weight position and position of the frame relatively ro the fixed frame permits shifting to the desired point.

Likewise, the energization of the coupling magnet 25 can occur only after the shifting, this sequence being enforce by the position of the contact device indicated at 50, 51 relatively to the contact device indicated at 56 and 57 in figure 6.

A deice constructed in accordance with the invention is shown in a very simplified form in Figures 8 to 10. This device advances a steel tape 100 continuously in one direction. The load (not shown) is attached to said steel tape.

The device as illustrated in Figures 8 to 10 comprises an exterior fixed frame 60 provided with tracks 61 extending longitudinally along the frame. A carriage 62 reciprocates on the tracks. The movable carriage which is the equivalent of the frame 15 in Figures 1 to 6 may consist of sided plates 66 joined by transverse plates 67 and it may be provided with balls or rollers 63 running on the track 61. The arrangement shown in Figures 8-10 produces a movement of the carriage in a horizontal direction, but it will be clear that the position of the frame and carriage in space is, in fact, immaterial.

The carriage 62 is provided with shafts 70 and 71, each shaft carrying a weight 74,75, respectively, which is eccentrically mounted thereon, the center of gravity of the weights being at a distance from the axis of the shaft.

It may be noted in this connection that the weights 74, 75 should embody as high a percentage of the total weight of the carriage as is constructively possible and conversely the carriage and the shafts should be as light as possible. This may be obtained by making the carriage of a light material such as light metal or a plastic or a light alloy, while making the weights of steel or of heavy metal alloys.

The shafts may be driven by any motor, for instance, by an electric motor which may be mounted on the carriage itself. However, in order to reduce the weight of the carriage the construction illustrated shows a motor which is mounted on the fixed frame and which transmits power to the shafts 70 and 71 by means of an intermediate shaft 78 joined to an extension 76 of one of the shafts 70 by means of a universal joint.

If the carriage moves in a transverse direction it is preferable to insert an intermediate shaft 78 between the motor and the shaft extension which either consists of two telescopic members or which consists of two parts one of which is splined on the other so as to permit longitudinal motion to a limited extent. The motor shaft is thus enabled to drive the shaft extension 76 notwithstanding its transverse linear motion.

A torsion coupling 80 is preferably inserted between the intermediate shaft and the shaft extension or if the extension is split as illustrated in Figure 8 the torsion coupling is inserted between the two parts 76, 76a of the extension. This torsion coupling is indicated in the figures as a torsion spring 80 connecting the two separate parts of the shaft extension 76 and 76a. The torsion coupling permits a relative angular movement between the drive portion of the shaft 76a and the driven portion 76. Such angular motion occurs on account of speed variations in the rotational speed of the weights which are driven by a motor of constant speed; such variations further occur during the shifting of the carriage at the end of an outwardly directed oscillation which has been described above. The shifting movement essentially moves the shafts without moving the weights thus producing a retrograde movement of the shafts. Further the shifting movement is not instantaneous and especially in the event of a high rotational speed of the weights the latter will perform an angular movement around the shaft of a sizable magnitude during the shifting operation. This angular movement is dependent on the speed of rotation and on the impedance of the solenoid which usually cannot be decreased below a certain value. A shifting of the carriage by the solenoids thus amounts to a retardation of the rotational speed

which is equivalent to a rotation of the shaft 70 or 71 in a direction opposite to the direction of rotation which movement must be taken up by the torsional coupling 80.

The weights 74, 75 must be strictly equal and must rotate at the same speed in an opposite direction. It is preferable to drive the shaft 71 by means of a gear wheel transmission from the shaft 70. These gear wheels are illustrated at 81 and 82, the two gear wheels 81, 82 meshing with each other.

The carriage 62 is freely suspended between springs 84, 85 which are attached to the frame and which are so dimensioned that they tend to bring the carriage 62 back into a central position whenever it has been moved to one side. The spring tension must be finely adjustable, as they must assist in stabilizing the operation and in maintaining the frame oscillation in the desired spot and in securing the correct sequence of operational phases. They are provided with special but well-known tension adjustment devices indicated at 89 in the figures. In fact, the carriage is always brought back to the fixed reference position R-R (Figure 9) not only by means of the solenoids 86 and 88 but also under active assistance of the springs.

The solenoids 86 and 88 are shown in the example illustrated as being mounted on a side plate 92 of the fixed frame but it will be understood that this is not essential. Each of the solenoids is provided with a movable core 91, 93 attached to a rod 94, 95 which is joined to a transverse plate 67 to which also the springs 85 may be attached.

In the modification illustrated in Figures 8 to 10 an electromagnetic clutch device is used. The electromagnetic clutching device consists of the clutch electromagnets 101 which are mounted on an extension 105 of the side plate 67 which magnets, in the example illustrated, drip the tape 100 carrying the load. The clutch electromagnets 101 preferably cooperate with an armature 103 which may face the two electromagnets and may close the magnetic field circuit upon energization of the said electromagnets, the tape being firmly gripped between said armature and the magnet poles and being thus moved with the carriage during such energization. Upon de-energization of the clutch electromagnets the tape is released and the carriage may start on its return movement without in any way affecting the tape.

In Figure 12 an electromagnetically operated mechanical clutch is illustrated. The tape or belt 150 is gripped by jaws 121, 133, each of which is linked to parallel pivoted levers 124, 126. the two jaws 121, 122 may be coupled by a transverse link 136. The jaws which are only displaced for a very small distance in order to lose their grip on the tape are operated by a solenoid 125 the core of which carries a rod 127 which is linked to one of the levers 124.

The mechanical coupling is preferably used to move heavier loads.

To obtain an accurate timing of the operation of the clutch electromagnets dependent on the completion of the movement of the carriage under the influence of the solenoids bringing the carriage into its correct position relatively to a reference system the energization of the clutch electromagnets is made dependent not only on the position of the weights but also on the completion of the shifting movement produced by the solenoids. This is obtained by controlling the energizing circuit of the electromagnets by a commutator device and by the slide contacts.

The commutator device in this case is replaced by a cam acting on the contact springs 114 and 115. The cam is mounted on one of the two shafts 71 and the cam surface is so adjusted that the closing of the clutch electromagnet circuits starts approximately in the zero position of the weights. To prevent, however, an operation of the clutch electromagnets before the solenoid has shifted the carriage 62 into the correct position corresponding to the position of reference R-R, the circuit contains also the contact spring 116 which comes into contact with the spring 120

only after the solenoid circuits have been closed for such a time that the solenoids have been capable of moving the carriage into the position in which the axis of the shaft 70, 71 have reached the correct reference position R-R.

This position R-R is the reference position to which the carriage has been moved by the solenoids and in this position only the slide spring 116 reaches the spring 120, thus closing the circuit of the clutch electromagnets. These clutch electromagnets thus move the tape only during that phase of the cycle during which the carriage is supposed to move the load. These electromagnets are de-energized when the cam 118 does no longer press on the contact spring 114, 115 such de-energization occurring when the carriage starts its back swing. During this back swing the tape to which the load is attached and which may be of any type or kind, must be prevented from sliding back when the grip of the clutch electromagnet is released. Any device gripping or holding the tape when attempting to move in an undesired direction, such as a sprocket wheel with a ratchet device attached to it may be used in connection with the tape. In Figure 8, a simple clamping device 122 cooperating with a fixed jaw 123 has been shown the movable jaw of the clamping device being mounted eccentrically and being under spring tension.

The control of the solenoid circuit is conformity with the position of the weights and with the position of the carriage relatively to the reference position R-R is exercised by means of the cam 110 operating the contact springs 111 and 112 and by means of the slide contacts 125 sliding on the fixed contact 126. the cams, contact springs and slide contacts are similar to those already described in connection with the clutch electromagnets.

The operation of the device will be clear from the following description.

The weights 74, 75 rotate rapidly with as high a speed as possible. The forces and reactions due to this movement of the weights in the direction of the line joining the axis of the shafts 71 and 70 are completely neutralized and only those forces which are at right angles thereto act on the system. Therefore, an oscillation of the carriage 62 in this direction will start, with the carriage moving back and forth on the tracks around a middle position R-R.

If it is assumed that during such oscillation the carriage 62 has reached its extreme position at the left in Figure 9 and weights 74 and 75 now reached approximately the zero position Z-Z (Figure 2) the cam 110 will close the contact springs 111 and 112, and, as their return journey in the direction of the arrows starts, the springs 125 and 126 also come into contact. Both control contacts of the energizing circuit of the solenoids being closed said solenoids are energized and pull the carriage forward in the direction of the arrow until the line joining the shafts 70 and 71 has reached the desired reference position R-R. In this position the device is now ready for applying a load. Cam 118 has already closed springs 114 and 115, as soon as the zero position of the weights 74, 75 was reached. In the position into which the carriage has now been brought the springs 116 also engage the spring 120 thus closing the circuit of the clutch electromagnets. The clutch electromagnets grip the tape and during the further carriage advance the tape is moved with the carriage.

When the resultant of the forces engendered by the rotational movement of the weights decreases to such an extent that the load can be longer be moved, the clutch electromagnets are de-energized by the cam moved by the weights. As soon as the carriage has reached its end position toward the right in Figure 9 it starts to move back, but the load cannot move back because the tape 100 is gripped by the clamping device 122, 123 and the carriage is therefore free to start its back swing. When the back swing of the carriage has been performed the weights have again moved into the zero position and the above described cycle will repeat itself and the tape will thus be advanced intermittently.

Obviously, the system may also be advanced along a fixed tape if so desired.

If a substantially continuous advance of the load in one direction is desired a plurality of devices such as described may cooperate. Figure 11 shows such an arrangement in which six devices of the same type cooperate with a single tape. By adjusting the phase differences between the devices and by distributing the gripping phases evenly by means of the commutators it is possible to move the tape in the desired direction continuously. These various phases may also overlap so that a practically continuous pull of the tape results. The devices may thus produce a practically continuous lift.

It will be clear that the system according to the invention may be used in many different ways and presents inherent advantages due to the fact that it is independent of reactions produced by external systems. The system, therefore, will be especially of advantage where such reactions have to be avoided.

Further, it will be clear that the embodiment of the invention which has been described may be changed in many ways, some of them have been indicated and such changes do not affect the essence of the invention as described in the annexed claims.

What is claimed as new is as follows: [Claims not included here]

US Patent # 3,182,517

11 May 1965

(Cl. 74-61)

Variable Oscillator System

This invention relates to a method and an apparatus for producing harmonic motion or reciprocation, the amplitude and period of which may be cyclically varies for various purposes related to either particular output displacement requirements or variable output force requirements.

It is therefore a primary object of the present invention, to provide a new and useful mechanical movement capable of producing an oscillatory or reciprocatory output from a rotary input at a constant angular speed, the output motion being cyclically controlled both as to amplitude and period so as to control the cyclical duration of transmitted forces for various purposes. The nature of the output motion and the manner in which it is achieved, therefore represents a novel departure from mechanical movements heretofore devised.

Another object of the present invention is to provide a system for producing controlled harmonic motion without the use of fixed motion constraining linkages that have heretofore rendered rotating mechanical systems of the type involved unable to efficiently utilize or control accelerating forces generated as a result of relative movement of the parts of the rotating system. Accordingly, the system of the present invention produces reciprocatory movement without relying upon the constant force transmitting linkages in which high accelerating forces are generated as a result of rotation imparted thereto by a rotatable input.

The system of the present invention therefore, involves rotation of an eccentrically weighted rotor that is mounted on a slide member so as to induce harmonic reciprocation of the slide member in response to rotation of the rotor without any fixed linkage connection between the slide member and the frame which constrains movement of the slide member to slidable movement in one plane. In order to control and cyclically maintain the harmonic reciprocation so

induced, a rotor displacing cam is engagable with the rotor assembly for engaging a point thereon at which no linear acceleration occurs in the direction of translation under conditions of continuous harmonic motin as induced by rotation of the rotor. As a result thereof, the center of motion with respect to which harmonic reciprocation occurs, may be cyclically shifted in order to vary the locus of the slide translation. The mechanism also includes means to cyclically limit the amplitude of slide reciprocation for a predetermined period during each cycle of reciprocation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being has to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a top plan view of one form of variable oscillator device with the housing lid removed and parts broken away;

Figure 2 is a sectional view taken substantially through a plane indicated by section line 2-2 in Figure 1;

Figure 3 is a sectional view taken substantially through a plane indicated by section line 3-3 in Figure 1;

Figure 4 is a perspective view of the relatively moving parts of the mechanism disassembled from the frame;

Figure 5 is a diagram illustrating certain relationships of the relatively moving parts of the mechanism;

Figure 6 is a top plan view of another form of variable oscillator device with the lid removed and parts broken away and shown in sections;

Figure 7 is a partial sectional view of a device illustrated in Figure 6 taken through a plane indicated by section lines 7-7 in Figure 6.

Figure 8 is a partial sectional view taken substantially through a plane indicated by section line 8-8 in Figure 7.

Referring to the drawings in detail, one form of mechanism generally referred to by reference numeral 10 is illustrated in Figures 1, 2 and 3. The mechanism 10 includes a casing or frame 12 for the device which may include a lid portion 14 secured thereto for supporting certain of the parts. It will be appreciated, however, that any suitable frame construction may be utilized for housing the relatively moving parts and/or for proper support thereof in accordance with the principles of the present invention. Securely mounted within the frame casing 12 by means of a plurality of fastener elements 16, is a slide supporting plate member 18. The slide supporting member therefore includes a slot 20 for receiving therewithin a slide assembly 22 thereby constrained to reciprocatory movement with respect to the frame 12. An output member 24 may therefore be secured to the slide assembly 22 for the purpose of transmitting reciprocatory movement of the slide assembly 22 to some device to be driven externally of the frame 12. Accordingly suitable guides are provided in the frame for the output member 24.

Rotatably mounted on the slide assembly 22, is a rotor assembly generally referred to by reference numerals 26. the rotor assembly 26 includes an arm 28 rotatably mounted about an axis affixed to the slide assembly 22 by means of a bearing assembly 30. Accordingly, the arm 28 is connected to a hub portion 32 which is connected to a shaft journalled in the bearing assembly 30 and by means of which rotation is imparted to the arm member 28. Connected to the radially

outer end of the arm 28, is an eccentric mass or weight member 34 by virtue of which accelerating forces or centrifugal forces are developed in the rotor assembly 26 in response to rotation thereof, so as to induce harmonic motion in the slide assembly 22 mounting the rotor assembly. The harmonic motion so induced will therefore depend on the value of the eccentric mass 34, and its radial distance from the rotor axis passing through the bearing assembly 30 if no mechanical restraint is imposed upon the side assembly 22 other than its guided mounting in the support plate 18. A retaining plate member 36 is secured is secured to the support plate member 18 in order to confine reciprocatory movement of the slide assembly 22 to a single plane with respect to the frame casing 12. Located between the rotational axis of the rotor assembly 26, and the center of mass thereof, will be an equilibrium point at which no linear acceleration in the direction of slide translation exists because of the simultaneous rotational movement of the arm 28 and reciprocatory movement of the slide assembly 22 mounting the rotating arm. At this point, a cam follower element or projection 38 is mounted for engagement by a displacing cam assembly 40.

The cam assembly 40 includes a hub portion 42 connected to a cam shaft 44 rotatably mounted by a bearing assembly 46 affixed to the frame by means of the housing lid 14. The cam surface 48 is profiled for engagement with the cam follower 38 a portion of an operative cycle so as to displace the rotating arm 28 and thereby the slide assembly 22 in a predetermined phase relationship to the harmonic motion induced therein in order to shift the center of motion or the center of the reciprocatory stroke associated with said harmonic motion as will be hereinafter explained. The support member 18 also rotatably mounts a bearing assembly 50 so as to define a cam shaft axis with respect to the frame 12 about which the second cam shaft 52 is rotatable. Connected to the cam shaft 52 is the hub portion 54 of a segmental cam element 56 which constitutes an amplitude control element limiting movement of the slide assembly 22 for a predetermined period during each cycle. Accordingly, an opening 58 is formed in the support member 18 for accommodating rotational movement of the segmental cam element 56 across one end of the guide slot 20 into the path that may otherwise be assumed by the slide assembly 22 in the absence thereof.

Referring now to Figures 2 and 4 in particular, an input drive assembly generally referred to by reference numeral 60 is illustrated whereby the slide assembly 40 and amplitude control device 56 are all drivingly interconnected for operation in proper phase relationship to each other. An input motor or prime mover 62 is therefore securely fastened to the frame by means of the support plate member 18 and suspended therebelow in any convenient manner. The prime mover 62 may take any suitable form and is capable of imparting a constant rotational speed to the drive shaft 64 suitably journalled by bearing assemblies 66 and 68 supported below the support plate member 18. Affixed to the drive shaft 64 are a pair of bevel gears 70 and 72 respectively meshing with bevel gears 74 and 76 to impart rotation to shaft 78 and 52. The shaft 78 is drivingly connected by meshing gears 80 and 82 to a shaft 84 which in turn is drivingly connected by gears 86 and 88 to the cam shaft 44 for imparting rotational movement to the cam assembly 40. Slidably mounted by means of splines 90 on the drive shaft 64, is a gear assembly 92 which meshes with a gear element 94 connected to the rotor assembly 30 for slidable displacement with the slide assembly 22. Accordingly, the sliding gear assembly 92 is rotatably and slidably mounted on shaft 90 about an axis perpendicular to the axis of the shaft 96 by means of the bracket 98. the drive shaft 64 will therefore impart rotation to the rotor shaft 96 at the same predetermined constant angular speed without imposing any restraint upon the slidable displacement of the slide assembly 22. the drive shaft 64 will also impart constant rotational

speed to the displacing cam assembly 40 and the amplitude control element 56 which are rotatably mounted about axes fixed to the frame 12.

Referring now to Figure 5, it will be observed that the slide assembly 22 and the rotor assembly mounted thereon are kinematically represented in some unknown phase position with the rotor arm rotating at its constant angular speed (*w*) in a clockwise direction as the slide assembly 22 is moving with harmonic motion in a leftward direction of translation along the path or slide axis represented by the X axis. Accordingly, the rotor axis of the slide assembly 22 represented by point S, is shown displaced from the center (O) of harmonic motion for the slide assembly by an amount x as the rotor arm 28 is angularly displaced from the X axis by an angle (*O*). As hereinbefore mentioned, the equilibrium point E on the rotor arm 28 will be that point at which no lionear acceleration exists in the direction of the X axis when the cam 40 is engaging the rotor arm 28 because of the combined movement of the rotor arm with respect to the rotor axis and the displacement of the rotor axis with the slide assembly 22. Inasmuch as the point E is being rotated with respect to the point S at a constant speed (w), it will be accelerated radially inwardly with respect to the moving point S by an amount $A_r = ew^2$. The linear component A_x of this radial accelration A_1 of point E along the X axis, will therefore be $A_x = ew^2 \cos \Theta$. Accordingly an equal and opposite or deceleration (acceleration opposite in direction to movement) must be imposed upon the slide assembly 22 along the X axis at point S in view of the equilibrium conditions at point E aforementioned. This deceleration A_x is always opposite to the direction of slide translation inasmuch as the velocity of the slide assembly or point S is reduced to zero as it approaches the end of the reciprocatory stroke of the slide assmebly. Since

$$d\left(\frac{V_x}{dt}\right)=A_x$$

and

$$A_x=-ew^2\cos\theta,$$

where

$$w=\frac{d\theta}{dt}$$

$$V_x=-ew\int\cos\theta d\theta$$

$$V_x=K-ew\sin\theta$$

since

$$V_x=\frac{dx}{dt}$$

$$X=\frac{k}{w}\theta+e\cos\theta+k_1$$

When

$$X=0,\ \theta=\frac{\pi}{2}(90°)$$

and

$$\cos\theta=0$$

Therefore,

$$O=\frac{k\pi}{2w}+k_1$$

and

$$X=\frac{k}{w}\left(\theta-\frac{\pi}{2}\right)+e\cos\theta$$

Where the displacement center is fixed at O, $k=0$. Where the displacement center O is not fixed it is shifted as a function of θ and $k\neq 0$.

Therefore, the cam surface **48** on the motion center displacing cam **40**, is designed to displace the point of equilibrium of the rotating arm **28** on the follower portion **38**, in accordance with the expression

$$X=\frac{k}{w}\left(\theta-\frac{\pi}{2}\right)$$

in order to displace the center of harmonic motion of the slide assembly 22 without linear acceleration thereof along the slide axis so as to avoid disturbing the harmonic motion induced along said slide axis by rotation of the arm 28 at a constant angular speed (w). During each operative cycle when the rotor is at a phase position where $O = 0$, the cam 40 leaves contact with the rotor arm and the center of harmonic motion will be displaced from its initial location at O, to a location at O' as represented in Figure 5 equal to an amount

(- k / 2w)

the negative sign indicating the displacement of the motion center in a forward direction for example opposite to the slide movement to point O'. The amplitude limiting cam 56 is then operative to engage the slide assembly 22 as the displacing cam 40 leaves contact occurring before the end of the slide stroke. The motion center for the slide assembly will therefore be shifted back to its original position O upon the frame so that its reciprocation stroke may be completed under inducement of the rotor movement. Also, when shifted back to the original position, contact of the rotor arm by the displacing cam 40 may be reestablished in order to begin a new cycle of operation. The amplitude limiting cam may therefore be profiled and phased so as

to constrain movement of the slide assembly, during a portion of its reciprocation cycle in one direction to thereby transfer to the frame those accelerating forces that would otherwise produce movement of the slide assembly during the latter portion of the reciprocatory cycle, and without disturbing the harmonic movement of the slide during the remainder of the cycle. It will therefore be apparent, that the rotating parts of the device may be designed in accordance with the foregoing principles and indicated relationships to achieve controlled harmonic movement modified by a cyclic shift in the motion center without the use of the usual motion constraining linkages so as to directly transfer additional predetermined forces to the frame during the poriton of the cycle predetermined by the cam 56.

The amount of the shift of the center of harmonic motion and the stroke of the slide assembly with respect to the frame may be varied. This may be accomplished by varying the stroke and phasing of the displacing cam and amplitude limiting cam so as to shift the harmonic motion center within the restriction of the aforementioned formulae.

From the foregoing description, it will be appreciated that the system will theoretically operate when the effect of dynamic unbalance on the frame is neglected as well as frictional forces that may modify the motion imparted to the slide assembly 22. To compensate for dynamic unbalance effects on the frame, the rotor assembly may be modified as illsutrated in Figures 6, 7, and 8, In the modified form of the device, the rotor assembly 100 is mounted on the slide assembly 102 by means of a laterally projecting member 104 affixed thereto and disposed perpendicular to the guide slot 106 constraining reciprocatory movement of the slide assembly 102 with respect to the frame 12. Adjacent opposite ends of the member 104, are mounted a pair of rotor shafts 108 carrying therewith eccentric mass elements 110. The eccentric elements are respectively connected to intermeshing gear elements 112 whereby the elements 110 rotate at the same speed but in opposite rotational directions. Accordingly, the dynamc unbalance effects of one rotor element will be counterbalanced by the effects of the other rotor element during each cycle of operation. Accordingly, each of the eccentric rotor elements 110 has a cam projection 114 affixed thereto and located at the point of equilibrium for cooperation with two separate displacing cam assemblies in a manner similar to that described with respect to Figures 1-4. Accordingly, an input drive assembly will also be provided similar to that described with respect to Figures 1-4. Also, an amplitude control device dimilar to the segmental cam eleement 56 will be provided in connection with this latter form of the device.

It will also be appreciated, that other but equivalent amplitude control devices may be utilized in place of the segmental cam element 56 such as controlled clutch or restricting devices operative to restrict movement of the slide assembly in one direction during a predetermined portion of the cycle while releasing it for movement in the other direction under the inducement of the rotor assembly and the displacing cam assembly. Such clutch or restricting devices may therefore be attached to the frame or the slide assembly.

From the foregoing description, operation and utility of the variable oscillatory device will be apparent. It will be therefore appreciated that the system of the present invention involves the conversion of a constant rotational input into an oscillatory output movement wherein the output movement is produced with respect to a shifting center of motion. As a result thereof, the output movement may be controlled in accordance with special displacement and/or force requirements. It will also be appreciated, that the variable output motion is achieved in a novel manner without the constant linkage conenction and/or force transmission ordinarily associated with devices of this type. Accordingly, a novel and purposeful departure in the transmission of forces is achieved because of the described kinematic relationships which govern operation of the mechanical

system. It will be appreciated of course, that the system while described in terms of specific but exemplary mechanical components, is not confined to such specific components or methods.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modification and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows: [Claims not included here].

***Analog* 69(3): 83-104 (May 1962)**

The Fourth Law of Motion

William O. Davis

You can get away with anything provided you don't get caught while you're doing it, and you leave the system immediately thereafter! --- J. Campbell

---

[*Author Biography*: --- Dr. William O. Davis is Director of Research of the Huyck Corporation of New York City. He was born in Buffalo, New York on November 11, 1919. He received his A.B. degree from New York University in 1939, with study at Cambridge University, England, on a Carnegie Scholarship from 1937 to 1938. He received his Ph.D. in physics from New York University in 1950.

In 1940 Dr. Davis joined what was then the Army Air Corps as a flying Cadet. At the close of World War II he was commanding the 824th Bombardment Squadron (B-24s) of the Fifteenth Air Force.

After completion of his graduate training in 1950 he became a member of the staff of the Los Alamos Scientific Laboratory as an Air Force Officer, where he worked on nuclear weapons development. From 1953 to 1957 he was Chief of Scientific Research, Headquarters, Air Research and Development Command and from 1955 to 1957 Deputy Commander of the Air Force Office of Scientific Research. It while in this post that Col. Davis initiated the Project Farside program discussed in the article "Pie in the Sky" in the August, 1961 ANALOG, the first U.S. Spaceprobe program to get instruments out into the van Allen radiation belt. And the one U.S. Space program to get there ahead of the Russians.

His last assignment in the Air Force, from 1957 to 1958, as Assistant to the Director of Laboratories, Wright Air Development Center. He resigned as Colonel from the Air Force in 1958.

In 1958-59 he was Vice President for Research, Executive Vice President and President, in succession, of the Turbo Dynamics Corporation. His research activities have covered the fields of cosmic ray neutrons, special weapons development, and the management of government and industrial research programs.]

Fundamentally, science must be a series of successive approximations to reality. It simply is not possible to arrive at absolute truth with a finite number of investigations. Physics at the Freshman level is a very straightforward subject. Facts are well known, relationships are stated in forthright terms without equivocation, and there is little room for doubt. It takes three years or

more of graduate school before it finally dawns on a budding scientist that the whole structure of science, so monumental when viewed from a distance, is a cracked and sagging edifice held together with masking tape and resting on the shifting sands of constantly changing theory. Nothing is known with any real certainty. Some things are merely more probable than others. Well-known theories and even laws turn out to be only partially confirmed hypotheses, waiting to be replaced with somewhat better partially confirmed hypotheses. If there is one thing we know about every theory in modern physics, it is that it is wrong, or at least incomplete. Sooner or later somebody will come along with a more general theory of which the old theory is seen to be a special case.

This is not a criticism of science, but merely a description of the scientific method. Like democratic processes in general--for science is necessarily a democratic process -- this method may seem a bit sloppy, and even bog down from time to time with authoritarian red tape, but it's the only method we know at the moment, and its results have been spectacular.

Progress tends to take place by a more or less random series of spurts in different fields at different times. The Laws in a given field of science will appear adequate for many years and little attention will be paid. The glamour is all in another field. Then little anomalies start showing up in engineering or scientific applications of the Laws which are accounted for by engineers through "Finagle Factors" and explained by scientists as "second-order effects." Usually, it takes a really major anomaly to generate the necessary speculation to derive a new and improved theory.

The field of Mechanics is a case in point. Euler, Lagrange, Hamilton, and Newton did such a beautiful job of synthesizing a workable theory that no further attention was paid to Mechanics for many years. Certain anomalies in astronomical data led Einstein to the Theory of Relativity, and the study of atomic physics led to the development of Quantum Theory, but the mechanics of simple everyday systems is still founded squarely on the cornerstone of the three Laws of Motion of Newton.

These Laws are usually stated in the elementary textbooks as:

First Law: Every body tends to remain at rest or in uniform motion in a straight line, unless acted upon by an outside force.

Second Law: An unbalanced force acting on a body causes the body to accelerate in the direction of the force, and the acceleration is directly proportional to the unbalanced force and inversely proportional to the mass of the body.

Third Law: For every action, there is an equal and opposite reaction.

By and large, the Laws of Motion have stood the test of time remarkably well. In spite of the newer concepts of Relativity and Quantum Mechanics, the basic meaning of the Laws has merely been interpreted, not challenged. Even then, interpretation has only been required in the case of very small or very large systems and in everyday life Newton still reigns supreme, much the distress of a host of would-be inventors.

There have been anomalies from time to time, of course, but it has normally been possible to attribute these to lack of sufficient information or understanding.

For a number of years, the author has been intrigued with a group of anomalies having to do essentially with rate of strain in materials and mechanical systems. It is well known, for example, that the strength of many materials is a function of the rate of strain. Some materials such as silicone putty, display this characteristic to a marked extent. The field of terminal

ballistics is replete with odd rate of strain effects such as the tendency of long projectiles to penetrate targets by means of a series of hammer blows. There are many other examples which come to mind from almost every field of science and engineering. Generally speaking, it is very difficult to explain such effects in terms of Newtonian physics, although it has been done.

Several years ago, the importance of rate-of-onset effects in general was highlighted for the author by studies of the dynamics of the high speed pressing of paper and textiles in the laboratories of Huyck Corporation based on a theoretical study by E.L. Victory. The need to solve certain problems relating to very high speed paper machines led to the creation of a small research program involving both theory and experiment.

Interest in this field was further heightened by the discussions of the Dean Drive started by John W. Campbell in these pages in 1960. Our earlier investigations led the author to the hypotheses that the Drive, if it worked, might be explained in some way by rate-of-onset effects.

This article is a preliminary report on findings of general interest which have resulted from this research program. It is not primarily designed to explain ‘reactionless’ drives, but certain conclusions will certainly have a bearing on the evaluation of those devices. Because this is a preliminary report, there will be no attempt to offer proof of assertions as such, although it is believed that existing data will tend to confirm theoretical predictions in the areas that have been investigated after the analysis has been completed.

A speculative theory will be proposed which has been logically and mathematically explored to some extent and checked against known data in various areas of science and engineering. No claim is made that this theory has been ‘proven’ any more than any theory is ‘proven’. We do believe that this approach will shed some light on certain problems.

Let us take a moment to review the meaning of the terms describing a body in motion. First of all, a body has a position, described in terms of its distance and direction from some arbitrary point or origin. To this distance we assign the letter, s. If the body is in motion it will move a very small distance, ds, in a very short time, dt, so that its instantaneous velocity will be given by $v = ds/dt$.

Note that the body might move in such a way that its distance from the origin remained constant and only the angle or direction changed; it might move directly away from the origin in a straight line so that only its distance changed; or it might move in some intermediate way so that both its distance and direction change at the same time. Thus, in general v must represent a rate of change of position in any of these ways. It represents not only a speed, but a speed in a certain direction, and therefore, like the displacement, it is called a ‘vector’.

If now, we make a small change in the velocity, dv, in a small period of time, dt, the body will have an instantaneous acceleration vector given by:

$a = dv/dt$ (1)

But, $v = ds/dt$, so that we can also say $a = d(ds)/dt(dt)$, which is normally written:

$a = d^2s/dt^2$ (2)

An expression like ds/dt or dv/dt is called a "derivative," and therefore v is called the "first derivative" of the displacement with respect to time. Since the derivative must be taken twice to get it, we say that a is the "second derivative" of the displacement. Thus, Newton's Second Law could be written (and frequently is),

$F = Md^2s/dt^2$ (3)

Let us now go one step further and assume that the acceleration is not constant. In other words, if we make a small change in acceleration, da, in a
short time, dt, the body will have an instantaneous "surge" given by:

å = da/dt = d²v/dt² = d^3s/dt^3 (4)

Surge is thus the "third derivative" of displacement. This quantity has previously been referred to as "rate of onset," "jerk," "kick," and a number of other terms. We use "surge" because it seems more appropriate to describe an action that may be repetitive or even continuous in some systems. We use the symbol å because it is conventionally used an an abbreviation for da/dt.

It is possible to continue indefinitely to define fourth, fifth, and higher derivatives of displacement with respect to time. In some cases, such as very high speed impact, this may prove later to be worthwhile. In most cases, higher derivatives will probably shed little light on the problem and in the case of cyclic or oscillating motion, it can be shown that a dynamic system can be completely described with not more than three derivatives. Higher orders may be present, but can always be expressed in terms of combinations of the first three.

The class of anomalous behavior which we wish to study involves in every case the presence of surge as we have just defined it. Under conditions of constant or zero acceleration mechanical bodies or systems of bodies obey Newton's Laws reasonably well. It is under conditions of changing acceleration that difficulties arise.

The key word in our analysis of dynamic systems will be "simultaneity." The Laws of Motion presuppose exact simultaneity of action and reaction. In other words, if the force exerted by Mass #1 on Mass #2 is suddenly changed, the force exerted by Mass #2 on Mass #1 must change in the same instant to satisfy Newton's image of the universe. Einstein recognized that this condition would not be met in the case of bodies separated by astronomical distances since the change in gravitational field would have to be propagated at some finite velocity, presumably that of light, but he did not carry his investigations into the simpler field of everyday mechanics.

If it is true that two stars cannot act as a Newtonian system in less time than it takes gravity to propagate from one to the other and back, it is equally true that any real body or system of bodies suffers to a greater or lesser extent from the same problem. Newton's Laws, strictly speaking, apply only to mathematically infinitesimal particles or perfectly rigid bodies, neither of which exists in the real world.

Consider, for example, a simple steel rod one meter long which I wish to move by applying a force to one end. The instant I start to apply the force a message leaves the end of the rod as a plastic or elastic compressive wave which travels at a speed of approximately 5,000 meters/second. The compressive wave travels to the far end of the rod where it is reflected as a rarefaction and returns to the point of application of force at the same speed.

Until the wave returns, 4/10,000 of a second later <i>the rod as a whole cannot move according to the Second Law! No matter how much force is applied, the center of gravity of the rod cannot obey F = Ma in less than this time. It would be oversimplifying to say that the rod acts as though it had infinite mass during this time, since the center of gravity will be moved somewhat by compression, but for all practical purposes, the rod acts as though it had a much larger mass than it actually has.

This phenomenon is observed with all real mechanical systems to a greater or lesser extent and is normally described in the engineering textbooks as the "starting transient." Although engineers must concern themselves with starting transients in such matters as determining peak power requirements for motors, science has devoted relatively little attention to study of this

phenomena, preferring, in general, to consider steady-state conditions where the Laws of Motion and the Laws of Thermodynamics may be more comfortably applied. Therefore, it is precisely with the starting transient that we will begin our investigation of the dynamic behavior of real bodies.

We have concluded that all real bodies or systems of bodies experience a starting transient when a force is applied. The particular behavior of a given system will depend on: (a) how rapidly the force is applied and, (b) the built-in delay time, or "critical action time" of the system. More exactly, we have found that the behavior depends upon how rapidly one attempts to *change the acceleration* applied to the body. The ultimate acceleration of the body, the "a" of F = Ma, is not what is critical; it is the *rate of onset* or "surge" of the acceleration which is vital.

Colonel John Paul Stapp, the USAF Flight Surgeon who subjected himself to crushing accelerations to investigate the hazards of seat ejection and airplane crashes, observed that the extent of damage to personnel and equipment depended in an important way on surge as well as the acceleration itself. In fact, today the USAF specifies limiting rates of onset as well as limiting accelerations for men and equipment. On one case, Col. Stapp estimated that the effect of a given acceleration on his body was over twice as great if applied at very high rate, than would be predicted by F = Ma !

Thus, it is not wholly illogical to attempt to solve the puzzle of high rate-of-onset anomalies by postulating that there is a force proportional to the rate of change of acceleration as well as Newton's force proportional to acceleration itself. There is no conflict here with Newton, for Newton considered only systems where either velocity or acceleration were constant. Since his data inputs were from astronomy and since he had no instruments capable of investigating effects of changing acceleration --- effects that may occupy milliseconds or less --- this is not particularly surprising.

What form should the Equation of Motion now take if we assume a force proportional to the surge as well as a force proportional to acceleration? The simplest assumption, and one which seems to be supported by preliminary data, is that the new force is additive, in the same way that forces due to viscous drag and displacement are additive. In other words, we now write the equation of Motion:

F = Ma + Aa(superdot) (5)

Where A is a new term which we have labeled 'intractance' and which has units of mass-seconds. Because the solutions of the equation in some cases yield the ratio A/M as the critical action time (CAT) of the system, we have in those cases assumed that the intractance is the product of the mass and the CAT:

A = DM (6)

Let us now see how this equation of motion can be used to analyze and predict the anomalous behavior of a simple system. Starting transients normally are considered only in connection with the beginning or the end of a motion and hence are accorded no particular attention. However, there are certain types of cyclic motion where the transient behavior is continuous, or repetitive and we will see later that even certain single transients may have critical importance in understanding natural events.

First consider the simple case of a real body subjected to harmonic oscillation. To make matters easier, we will assume that there is no restoring force proportional to displacement present and no viscous damping in the system. If the applied force is simple harmonic in nature it may be expressed in the form:

$$F = F_0 \cos 2\pi ft \qquad (7)$$

(7)

where *f* is the frequency of the vibration in cycles per second, and *t* is the time in seconds after the beginning of the motion. The Newtonian equation for vibration in one dimension would be:

$$F_0 \cos 2\pi ft = Ma = \frac{Md^2x}{dt^2} \qquad (8)$$

(8)

and the displacement of the driven body would be:

$$x = x_0 \cos 2\pi ft = \frac{-F_0}{4\pi^2 f^2 M} \cos 2\pi ft \qquad (9)$$

(9)

In other words, the displacement will obey Newton's Second Law and will be exactly opposite in phase to the driving force, thus also satisfying the Third law.

However, if the body to be oscillated is real, it will not respond instantaneously, so that the rate of onset must be considered. The equation of motion then assumes the form:

$$F_0 \cos 2\pi ft = Ma + DM\frac{da}{dt} = M\frac{d^2x}{dt^2} + DM\frac{d^3x}{dt^3} \qquad (10)$$

(10)

where D is the delay time, or CAT of the body and da / dt is the surge. D is assumed to be constant.

This equation has the solution:

$$X = X_0 \cos (2\pi ft - \phi) \qquad (11)$$

(11)

where

$$\tan \phi = 2\pi fD \qquad (12)$$

(12)

and

$$X_0 = -\frac{F_0}{4\pi^2 f^2 M Z} \quad (13)$$

(13)

where Z is a sort of complex impedance and

$$Z = \sqrt{1 + 4\pi^2 f^2 l^2} \quad (14)$$

(14)

The important feature to note in this solution is that the amplitude of the oscillation is less than predicted by the Newtonian equation and even more important, there is a phase angle between the driving force and the displacement, even in the absence of viscous damping. This solution demonstrates the most significant characteristic of real bodies, to wit: not only is displacement somewhat less than Newton would predict for a given force, leading to an increased apparent mass, but reaction is no longer exactly opposite to the applied force: there is a phase angle which will be larger the longer the CAT of the system! Action and reaction are not simultaneous!

A technical paper will be published in the near future which will present a more general discussion of solutions to the equations of motion. The solution presented here will serve only to show the effect of CAT in a system under the simplest situation. The disastrous effect on the theory of mechanics of the existence of CAT in real bodies may be realized at once when we consider a system so arranged that the CAT is not the same in all directions.

If, for example, we build a mechanical oscillator such that the CAT is short compared to the period of oscillation in one direction, the mass will appear to be approximately Newtonian and the phase angle of reaction will be negligible when the oscillator is moving in that direction, If we now change the system to make the CAT much longer during the time the oscillator is moving in the opposite direction, the mass will appear to be greater and the phase angle larger, even though the total applied force is exactly the same I the two directions. Thus there will be a net unidirectional acceleration of the driven mass in the direction of the least apparent mass even though the applied force is balanced!

This conclusion is merely a logical consequence of the existence of a force proportional to the third derivative. We have not yet, of course, considered how such a behavior could be possible in terms of physical reality.

In recent years a number of ‘reactionless’ drives have been proposed and some demonstrated, including the controversial Dean Drive. To the extent that any of these devices have produced useful thrust, they presumably have embodied this principle. It is not the purpose of this article to attempt to explain the operation of these systems as such, nor to claim that any of them are practical devices. However, an analysis of the possible compatibility of some form of mechanically reactionless drive with the body of known data from the past may help shed some light on deficiencies in present theory and, hopefully, lead to some useful applications.

If a device of this kind operates, what has happened to the Laws of Conservation of Momentum and Energy? Actually, the situation is no worse than it once was in the field of electricity. It was sincerely believed a century or so ago that it would be impossible to do work with alternating current without violating the Conservation of momentum, since the average current was zero. Although the current in one direction is balanced by an equal flow in the opposite direction, the

flows are not equal and opposite simultaneously and thus work can be done. Furthermore, when all else failed, radiation was invoked to preserve the Conservation of Momentum.

We are going to try the same approach. Let us again consider the case of a real body, having mass M and constant CAT D, moving in one dimension, and let us calculate the kinetic energy of the body. If the force is applied over the distance between two positions X_0 and Z_1, during a corresponding time interval, t_0 to t_1, then it can be shown that:

$$\int_{x_0}^{x_1} F dx = \left[\frac{Mv^2}{2}\right]_{t_0}^{t_1} + D\left[\frac{d}{dt}\left(\frac{Mv^2}{2}\right)\right]_{t_0}^{t_1} - DM\int_{t_0}^{t_1} a^2 dt \quad (15)$$

(15)

where v is the velocity and a the acceleration in the x-direction.

It will not be necessary to go into the calculus involved. The important point is that only the first term on the right-hand side is Newtonian. The second two terms represent the portion of the energy that has not been converted to kinetic energy because of third derivative effects. This portion of the energy, in keeping with the terminology applied in modern nuclear physics to particles which exist in the nucleus for too short a time to violate the law of the Conservation of Energy, we have called the 'virtual energy'. Thus this equation expresses an amendment to the Energy Conservation Law by a new 'Principle of Virtual Energy'. If a force proportional to surge exists, then a logical consequence is the existence of such 'virtual energy. We will continue to explore the question of whether this makes sense in terms of the real world.

Let us see what the presence of virtual energy in a system implies. First of all, if the acceleration is constant the sum of the virtual energy terms is zero and the equation becomes Newtonian. The equation is not readily soluble for an arbitrary variation of acceleration with time but a simple example will demonstrate the principle. Let us assume a constant surge as such that the acceleration varies according to:

$$a = a_0 t \qquad (16)$$

(16)

For the sake of simplicity let us assume that we are describing a rocket during takeoff so that the initial displacement, velocity, and acceleration are all zero and $t_0 = 0$. We will also ignore the presence of the earth's gravitational field, since the conclusions will not be affected. One can then find the solution that at time t, the virtual energy is given by:

$$N = \frac{DMa_0^2 t_1^3}{6} \qquad (17)$$

(17)

This means that the kinetic energy at t1 will be too small by this amount. The rocket will have acted as though it were heavier than its true weight! What has happened to the energy that has been lost?

Now it is necessary to go back and make some postulates. A moving electrical charge creates a magnetic field. Einstein, in his general Field Equations assumes that a moving gravitational

‘charge’ or mass will also produce a field. The predicted strength of such a field is extremely small for any reasonable velocity, smaller in general than the gravitational field due to the mass alone. Any radiation resulting from the interaction of the gravitational and ‘inertial’ field --- in the same way that electromagnetic radiation results from the interaction of the electric and magnetic fields --- is thus so small as to be negligible in any practical system.

Although all of the reasons cannot be developed here, I believe it is more reasonable to postulate an ‘inertial’ field due to acceleration of a mass rather than simply due to its velocity. It is as though the fundamental ‘charge’ were momentum, Mc, instead of simply the mass, M.

It is possible in this light to point immediately to the gyroscope as a well-known example of an inertial field. Mathematically, the ‘angular momentum’ of a gyroscope is calculated from the motion of the mass in the wheel in exactly the same way as the magnetic field of a solenoid is calculated from the flow of current. Mathematically, then, ‘angular momentum’ may be said to be identical with ‘inertial field’ in this case, and we will prefer the latter terminology. Anyone who has felt the resistance of a gyroscope to precession will know that this type of ‘inertial field’, if that is what it turns out to be, is far from negligible. The forces involved may be very large with a heavy wheel rotating at high speeds. Since there exists a constant centrifugal acceleration in a gyroscope running at constant speed, any attempt to precess the device must automatically result in a ‘third derivative’ reaction force, since the acceleration is being changed.

Based on this example it can now be seen that the coefficient of the third derivative or surge term in the Equation of Motion must represent the resistance of the system to a change of inertial field, in the same sense that self-inductance represents the resistance of a coil to a change of magnetic field. We have discussed a case where we assumed that this coefficient was the product of the mass and the CAT of the system. This is not necessarily true of all systems, so that we choose to define this coefficient more generally in relation to the inertial field as ‘interactance’ of a system. Thus the force due to rate of onset may be defined as the product of the intractance and the surge.

The well-known concept of a limiting velocity of propagation for energy in any form established by Einstein is a direct embodiment of the intractance of real systems. In fact, viewed from another point of view, it is precisely the intractance of a system which requires that propagation velocity be limited. If energy could propagate at infinite speed, then it would be possible to change the energy of a system in zero time.

Now it is possible to visualize a completely new type of radiation resulting from the existence of this type of inertial field. If an electron radiates electromagnetic radiation when it is accelerated, then clearly we will now expect a mass having intractance to radiate gravitational-inertial radiation when it is subjected to surge. It is in fact my postulate that the flux of such radiation from a system is proportional to the rate of change of virtual energy. Based on this assumption, the energy which has failed to appear as kinetic energy or potential energy in the example of the rocket we discussed, has left the mechanical system in the form of gravitational-inertial radiation, as we have defined it.

For obvious reasons it will not be practical to go into the mathematical steps taken to arrive at this conclusion, but once again we have followed a logical course starting from the assumption of a third derivative force. It is interesting to note that the new radiation, if it exists, will have radically different characteristics than electromagnetic radiation, at least as it is now described. First of all, it is not dipole radiation, but more like the radiation from an ‘end-fire’ antenna. Secondly, each period of changing acceleration produces a ‘quantum’ of radiation equal to the change of virtual energy, so that the emission is not continuous.

The consequences of this behavior will have to be explored in more detail in the future. It is even possible that this approach may shed some light on the quantum nature of electromagnetic radiation. For example, we have considered the hydrogen atom in an excited state. By writing the equations of motion for an orbiting body with intractance, it can be shown that when third derivative effects are considered the angular momentum is not initially constant! In fact the equations show that a body first placed in orbit contains a significant transient term in the expression for its angular momentum which ultimately decays to a constant with time.

Furthermore, the energy lost during this decay disappears entirely from the mechanical system and can only be accounted for by some form of radiation! Thus if the electron of a hydrogen atom were excited with additional kinetic energy, out theory would predict the radiation of a quantum of energy during this decay time. It is therefore possible that the quantum condition is a perfectly logical consequence of thee existence of intractance in real systems, and that thus quantum theory can be derived from Newtonian physics!

During this brief discussion of the application of our theory of real dynamic systems to nuclear physics some reference should be made to the upwards of 40 new nuclear particles which have been postulated in recent years. Since many of these particles have been postulated to explain an apparent violation of the Conservation of Momentum during some very brief time period --- brief even by nuclear standards --- it is possible that the Principle of Virtual Energy may offer an alternative explanation in many cases.

Quite apart from the possibility of inertial radiation, several conclusions may now be drawn, at least on a tentative basis. When computed including intractance, the solutions to the equation of motion indicate that very large systems should tend to be unstable, unless the mass in the system is very large. This conclusion, for example, may have a bearing on the theory of the expanding universe. Furthermore, it suggests that the application of thermodynamic analysis to large systems should be re-examined. Thermodynamics relates to systems in equilibrium and simultaneity is obviously important. If gravitational waves propagate at the velocity of light, which is by no means certain yet, then the CAT of the observable universe is roughly 12 billion years and simultaneity cannot be defined for the complete system in less than that time. Thus it should be perfectly possible to reverse entropy in a local area and not have to pay the piper for a very long time!

We come now to a consideration of what must be the Fourth Law of Motion. There will obviously be several alternative expressions. Mathematically, what seems to be critical in systems with intractance is the rate of change of energy, so that the Law is perhaps best expressed in these terms: The energy of a given system can only be changed in some finite length of time depending n the system, and never in zero time.

Similarly, one can suggest an expression for the Fourth law of Thermodynamics, to wit: Systems can only be considered to be thermodynamic in nature of time periods large in comparison to their CAT. In other words: You can violate the first three Laws, providing you don’t get caught while you’re doing it!

At this point, it is proper to ask the question: Is there any real evidence for this theory, and if it is true, why haven’t these phenomena been obvious for some time?

First of all, rate of onset effects per se are well-known and their existence is hardly controversial. The entire field of shock and vibration gives signs of supporting our conclusions. In general, mechanical systems do not possess the simple resonance characteristics that Newtonian theory would predict. The existence of intractance permits many more modes of resonance since there

are now four terms of interaction in the equation of motion for a system restoring force instead of three. This permits a much greater number and variety of resonances to occur.

The discovery of the existence of 'virtual particles' in the atomic nucleus, which appear to violate the Conservation of Energy, is an important addition to the list of anomalies which suggest the validity of the theory. Under the assumption that the theory is correct, it is possible to derive the quantum condition from the planetary model of the atom. In short, wherever the theory would predict certain behavior, there are indications that the behavior is present. Obviously, the mere fact that an equation gives correct results does not mean the theory is correct. The model must also make sense.

Most obvious embodiments of third derivative theory are associated with high rates of onset, impact, or strong vibrations. Under these conditions, it is very hard to make measurements. It is hard to find accelerometers, for example, which have response times sufficiently short to permit proper observation. For another thing, a system running in a continuous or intermittent transient mode tends to create very large internal forces which are very destructive. It is hard to maintain a system at its proper operating point for a long enough time to make observation. It is highly probable that most data of this type of behavior consisted of observations of the type, 'Then the machine broke down for no known reason', or 'Witnesses stated that the wing suddenly broke off the airplane'.

Evidence for the existence of inertial radiation is not quite as plentiful. The concept of gravitational waves is not a new one, and in fact is implicit in the weak-field solutions of the Einstein General Field Equations, known for 40 years. On the other hand, the type of gravitational-inertial radiation predicted by our theory is quite new since it is presumed to be a consequence of surge rather than simple acceleration. The magnitude of the Einstein radiation is predicted to be so small as to defy detection, but the radiation described here should be clearly observable under the right conditions.

For example, the success of one of the proposed 'reactionless' drives would strongly tend to confirm the existence of the radiation. At the same time, if the radiation is generated it should be detectable, and sooner or later a 'Hertzian' experiment will have to be performed. A number of experiments are now underway in our laboratories at Huyck Corporation which we hope will provide confirmation in the near future. Preliminary tests have produced favorable qualitative results, but data has not been sufficiently accurate to permit a proper statistical correlation. We hope to correct this situation with new instrumentation by the time this article appears.

In addition to the author, a number of individuals have played key roles in the Huyck Dynamic Systems Project. The experimental work was performed at the Huyck Research Center at Milford, CT, under the direction of Mr G. Henry Stine who also contributed a number of concepts to the theory. Theoretical calculations and analytical studies were performed by Mr E.L. Victory. Certain specialized instrumentation and general consultation were provided by John W. Campbell, uder a consulting agreement, and overall professional review of the theoretical and experimental programs has been given by Prof. Serge A. Korff, of the Physics Department at New York University. We are also deeply indebted to Dr O.G. Haywood, Vice president of Huyck Corporation, for technical and moral support.

Obviously, there are an almost unlimited number of fields where the consequences of this theory might be explored. Validation, if ever, will probably result from may experiments in many fields. We cannot perform them all. We intend to continue our own research program and will be interested to hear of the results produced by other groups.

Science, as we said, is a series of successive approximations to reality. Here is another approach. Let's find out if it's a better approximation.

***Analog* (October 1962): 'Brass Tacks'**

Dear John [Campbell]:

Dr Davis and I were finally able to settle our arguments over the equation that appears in Figure 4 of our article entitled 'The Fourth Law of motion' in the May issue of Analog only after I studied the equations --- which are incidentally the Lagrangian form of the third derivative Law and the differential equation of the angular motion of an orbiting body --- as they were recorded by the camera.

After noticning the missing dot that was not on top of the O on the second term of the differential equation, we realized who was right.

May I also correct equation 17 by squaring the term a(dot)o ---

E.L. Victory, Huyck Corporation, NY.

***ANALOG Science Fiction / Science Fact* (June 1976)**

Detesters, Phasers and Dean Drives

by

G. Harry Stine

In common with many other people, I once carried on a prolific correspondence with the late John W Campbell, former Editor of Analog. We discussed lots of things, and it was stimulating because we were usually thousands of miles apart. Even today as I reread the letters, it is high intellectual adventure. If anyone thought Campbell's Editorials were controversial, he would have considered the Campbell correspondence outrageous, because JWC often tried out Editorial ideas first in correspondence with friends and readers.

However, John's single-page letter of August 21, 1959 --- highly unusual because his letters normally ran to a minimum of 4 or 5 pages, sometimes more, rarely less --- was to change my life and that of several other people beyond our wildest imaginings.

To quote the letter directly: 'If you recall, some while back I said I believed we wouldn't sue rockets to reach the planets… This week, I saw photographs of a working model of a space drive engine. It makes a monkey's uncle out of the law of conservation of momentum as we know it. The working model demonstrated the principle but was, understandably, not very successful as a flying machine. The inventor couldn't afford the auto-pilot system to stabilize it in mid-air… The device was powered by a standard 1/4 inch electric drill… a non-flying model resting on a tabletop, on ball-bearing wheels giving effectively zero friction, exerted a push of about 85 pounds --- also 1/4 inch drill-motor powered. Set on end on a standard weighing machine, it weighed 135 lb. With the motor activated, the weight dropped to 50 lb.

'Engineering calculations --- made by an outside firm of professional consulting engineers --- show that a 3000 lb machine could rise with an acceleration of 37 ft/sec^2 --- 5 ft/sec^2 over G --- when driven by a 25-hp engine at 2800 rpm. With a 150 hp engine at about 4000 rpm, it would have a gross vertical acceleration of 2 G, net of 1 G.

‘The device is purely mechanical. It depends on an elegant application of principles of centrifugal force in orbiting masses when the center of orbits is changed in a precisely phased manner. The actual result is that momentum apparently appears at the expense of energy.

‘I am getting detailed information as rapidly as I can’.

Naturally, I was excited. My return letter asked all sorts of questions. But it became a secondary thing in my life because I had just lost my pioneer model rocket company. I was starting work as an engineer at Stanley Aviation Corporation in Denver, and we had a new baby on the way. Looking back on that letter today, I realized that I had since learned that John Campbell was an excellent editor, fantastic writer, outstanding scientific dilettante, and somewhat confused physicist when it came to the Dean Drive… which has confused a lot of physicists.

My work at Stanley was not totally unconnected with what later happened. We were developing the crew escape capsules for the supersonic B-58 Hustler bomber. As the escape capsules were blasted out of the plane, they were dynamically stabilized by yokes with fins that snapped up. This was necessary to keep the rotation rates and acceleration within the stiff USAF criteria for human factors established by Col. J. P. Stapp on his rocket sleds.

Well, that was the way it was supposed to work, but we couldn’t keep the damned yokes from breaking off.

All calculations by the stress group proved that the cables and booms were more than strong enough to absorb the expected loads. But when they were catapulted out of the rocket sled at Hurricane Mesa, Utah, the yokes left the capsules at the booms and cables snapped. When I ventured meekly to point out to the stress engineers that there might be additional forces involved because of the rapidity with which the loads were applied, the reaction was, ‘You mean to tell us that stress isn’t proportional to strain?’

I got more deeply involved when we decided to challenge the USAF human factors limits which were based on a maximum of 15 Gs with a rate of 1500 G/second rate of onset. It seemed to us that ordinary athletes exceeded those limits regularly. So we put accelerometers on the shoulder pads of two burly University of Colorado football linemen and recorded what happened when they tackled each other. The data revealed that they had sustained accelerations of over 45 Gs at rates of onset of 5000 G/sec. This was written up in Time magazine, and we got the USAF to relax their human factors specs so that we could build a capsule that would stay together.

But before the Stanley capsule was qualified, I went to an American Rocket Society meeting in Los Angeles and met an old friend, Dr William O Davis, retired Colonel in the USAF, former director of the AF Office of Scientific Research, and mentor of Project Farside. He had just taken a position as Director of Research for a small, obscure company on the east Coast named Huyck Corporation. He asked me to join him in New York City as his Assistant Director of Research. I did so, moving to Connecticut and commuting to NYC for the first time in July 1960.

In the meantime, John Campbell set the SF world on its ear again --- it was still recovering from Dianetics and psionics --- with an Editorial in the December 1959 issue of Astounding Science Fiction, as Analog was called then. In brief, he revealed to the readers what he had told me in his August 1959 letter.

The science-fact article in the June 1960 issue was written by Campbell with photographs that he had taken. It concerned this wonderful machine which he dubbed the Dean Drive.

The inventor of the device was Norman L Dean, a civil service employee residing in Washington DC. He had no formal training as an engineer or scientists; he was a typical amateur tinkerer and

inventor. In common with most inventors, he didn't know that it couldn't be done, so he went ahead and tried.

Dean obtained US Patent # 2,886,976 on his device, but it will not tell you much about how to build a Dean Drive.

Basically, the Dean Drive consisted of a pair of eccentrically-mounted, counter-rotating masses driven by an electric motor through a pair of slipper-type universal joints and a slip or sleeve joint. The rotation of these masses produced an oscillating motion commonly known as simple harmonic motion. The use of rotating masses to produce oscillatory or vibrating motion is widely used in industrial practice and is commonly called a Buehler Drive. However, in the Dean Drive this oscillating carriage was not permitted to oscillate freely. At one point in its cycle, the oscillating frame was hard-coupled to the main frame of the machine or to the force rod coming out of the side of the frame. During the remainder of the cycle, the mechanical oscillator was free and unclutched.

The operation of the Dean Drive is very complex and is not amenable to quick-and-dirty analysis. It is a dynamic system.

Although Campbell's article dwelt mainly on the fact that no government agency, especially NASA or DoD, had ever bothered to take a look at the Dean Drive, Campbell stated in his article: 'I think Dean's device is a true space drive; that it does work… Again, I emphasize, it is not important whether Dean is right or wrong; what is important is that the (government) agencies did not find out'. However, Campbell stated that he did believe that the Dean Drive was not a practical device, but a 'proof of principle' machine. He also stated that he really didn't fully understand why the Dean Drive seemed to work and that he really didn't believe Dean's own mathematical analysis or operating theory. This is an important change in attitude on Campbell's part between his August 1959 letter to me and the June 1960 ASF article. Perhaps the difference can be laid to the fact that in his letter he was writing privately to a fellow space nut while his article was written for ASF readers.

Because our responsibility in Corporation Research was to investigate for Huyck Corporation any promising area of science or technology that might lead to the development of new industrial products for the company, Dr Davis and I drove to Washington DC on September 27, 1960. On the morning of September 28, we drove to Dean's apartment on Wisconsin Avenue.

I quote now from the laboratory notebook of Dr William Davis, dated September 30, 1960, and signed by me as a witness, indicating that it amounted to a joint report:

'Visited Mr Norman Dean in Washington on September 28 at the suggestion of John Campbell to see the Dean Drive in action. The device he showed us did not levitate, but applied a lateral force to a mass. Harry Stine accompanied me, and both of us approached this unlikely device with skepticism. The mechanism was constructed of metal and Lucite in such a way that the moving parts were clearly visible. We checked for the usual gimmicks of air hoses and the like but found nothing. The model rested on the waxed floor of Dean's apartment. Hidden magnets seemed unlikely and in any event could not account for the magnitude of the forces displayed, particularly since there appeared to be very little ferritic material in the device.

'The drive was arranged so as to apply its output to a push-rod which was fastened to a reaction mass (also open) which appeared to weigh approximately three times as much as the drive unit. We inspected both the drive and the reaction mass before and after the demonstration and are convinced that both were free to move on the polished surface of the floor. There was no

observable tilt to the floor. Both masses rested on flange type feet and no scratches were observed on the floor when either was slid.

‘When the drive was brought up to speed and the clutch mechanism activated, the drive was observed to produce a force such that the reaction mass was moved several millimeters in a gradual, steady manner while the drive unit did not move at all when observed closely with the naked eye from a distance of only a few inches.

‘A second experiment was performed where the reaction mass was replaced by each of our hands in turn. When the drive operated, a definite force was felt which increased with pressure and produced motion of the hand against the pressure. With the drive turned off, this same pressure easily moved the drive unit several inches’.

(Yes, the Dean Drive did push against my right hand as described. After all these years, I can still recall it vividly.)

‘It was the conclusion of both Harry Stine and myself that we had witnessed a real anomaly and that the possibility of fraud in the demonstration was slim. When this is combined with the testimony of other competent witnesses, some of whom have witnessed the weight reduction experiment, it seems increasingly likely that Dean has produced a genuine new phenomenon. His explanation, as given in his papers on the subject, does not strike me as valid, but whether or not his theory is correct we have seen something new which I do not believe can be accounted for with classical Newtonian analyses. For this reason, I have decided to undertake a theoretical study of dynamic systems to see if a concept can be evolved which will describe a world in which Dean’s Drive can exist and yet where other known facts are not contradicted’.

I have taken the liberty of quoting extensively from written notes made within a day or so of witnessing the phenomenon of the Dean Drive in operation because they more accurately express our joint observations of the time and do not exhibit the ravages of time on the memory. They serve to key other significant memories as well.

On the way back to Connecticut that night, I can still vividly recall Bill Davis blurting out, ‘I wonder if there is a force proportional to the rate of change of acceleration?’

His question led him right back to basic Newtonian mechanics where he added a fourth term, a third derivative, to the general equation of motion. By October 14, 1960, Davis had worked out the basic mathematical equation that he later published in his May 1962 Analog article, ‘The Fourth Law of Motion’.

His notebook entry for October 21, 1960 contains an important note:

‘One point suddenly occurs to me. One consequence of the foregoing analysis, if it later proves to be correct, is that the operation of the Dean Drive does not depend upon the rotating weights, but only on the motion of the axle, however induced. In other words, if a simple harmonic driving force is applied to a point with suitable cyclic parameters, then an unbalanced force should result. Obviously, this driving force might be applied by other mechanical means, or by means of magnetic and/or electric fields. Thus it becomes possible to design an entirely new kind of inertial drive which does not incorporate the principles of Dean’s machine as outlined in his patent claims!’

This was an important theoretical breakthrough because Davis had had no success at all in attempting to deal with Norman Dean. Most inventors want a million dollars and Dean was no exception to the rule. We could not get our hands on a Dean Drive with which to experiment.

Nor could we legally attempt to construct one from the patent data, John Campbell's excellent photos, and our own memories.

Although Davis had worked out a theoretical universe in which a machine like the Dean Drive would be possible, we both knew that mathematics will lead you only to the logical conclusions of your basic assumptions. The theory had to be backed up with experimental evidence, and we didn't have the Dean Drive to work with. Bill Davis and I spent months searching for an elegant experiment that would either prove or disprove Davis mechanics --- Robert Heinlein hung that sobriquet on the work in Chapter 9 of Podkayne of Mars, so I guess it's official. Professor Serge Korff of the physics department of NY University, a top cosmic ray researcher, and later president of the NY Academy of Science s and the Explorers Club, was retained as a consultant by Huyck Corporation at Bill Davis' request to 'keep us honest' academically; as a top flight physicist, Professor Korff's duty was to shoot us out of the saddle if the logic was faulty, the math bad, or the experimental program trivial. John Campbell was also retained as a consultant with the responsibility of assuming his classical role of a hair shirt; he kept us honest in a different way. We were soon joined by a young Iranian mathematician, E.L. Victory, a graduate of MIT who was working for Huyck at the company's paper machine felt plant in Renssalaer, NY. Vic had just been given the problem of analyzing why the wringer-like press section of a paper machine wouldn't squeeze water out of paper and the Huyck felts at high machine speeds. Vic had come to the tentative conclusion that the rate of onset of force between the press rolls didn't give water time to get out of the paper or the felt, creating a situation akin to the tire hydroplaning that was later described by the British.

The basis of Davis mechanics rests on the hypothesis that the energy of a system cannot be changed in zero time. In other words, there is a 'critical action time' during which the system cannot behave in a Newtonian fashion and during which the system as a whole cannot accept the energy. In the case of an applied force in one dimension, Davis mechanics revives the classical Newtonian equation to the following form:

F = kx + V dx / dt
+ m d^2x / dt^2
+ Dm d^3x / dt^3

This is the basic Newtonian equation of motion with the exception of the third derivative term where k = Hook's Law spring constant, V = viscous damping coefficient, m = mass, and D = the elusive critical action time.

Once a month, a meeting was held in the Huyck offices in New York City in which the theoretical and experimental programs were reviewed. Always in attendance were Bill Davis, Vic Victory, myself, Serge Korff, and John Campbell. Because the initials of 'critical reaction time' are CAT, we became the 'CAT Pack'. These were wild meeting because Davis and Victory were making real progress on the theoretical mathematical background of Davis mechanics, and the work was making logical sense. One meeting really sticks in my mind; in late 1961, I sat astounded and watched Professor Korff derive Planck's Constant and the quantum condition from Newtonian mechanics using the hypothesis of Davis mechanics.

But the experimental program didn't run so well. In late 1960, I set up a small experimental area at the Huyck Equipment Company building, an old WW2 barracks located on Factory Lane in Milford CT. With the help of an excellent experimental machine shop downstairs and Wendell Stickney, Huyck's very practical, brilliant development engineer, I built a series of devices capable of generating simple harmonic motion. We were looking for some indication of the CAT, the elusive D in the Davis equations.

Obviously, these devices were known as D-testers, or simply Detesters.

One by one, these experimental rigs were rejected because we could not account for all of the forces and therefore could not isolate D.

Finally, in May 1961, we decided to take a very close look at precisely the harmonic drive mechanism that was used in the Dean Drive. This is a device known as a Buehler Drive and it is commonly used throughout industry to generate vibration or oscillatory motion. It consists of two counter-rotating eccentric masses. I designed the device and had it built in the little machine shop. I still have the original drawings; I could build another one just like it today, and I might do it sometime. It was accurately described in a letter from E.L. Victory and me that appeared in the Brass Tacks department of the September 1963 Analog:

‘Mass of the rotating weights was 1607.3 grams, and the ration of the mass of the weights to the mass of the carriage was 0.9333. The test device was driven by a 1/4 inch electric drill motor, which was equipped with a 6-inch diameter 10-pound flywheel to insure constant rate of angular rotation, thence through a universal joint, a slip joint, and another universal joint. A protractor-type dial was affixed to the front of the device with a pointer the shaft of the upper mass to indicate angular position of the weights. A cursor line and scale were used to determine position of the carriage in the lateral direction. Operation was observed with the aid of a General Radio 'Strobotac', and photographs of the operating device were made. A Variac adjustable autotransformer was used to control the rotational speed of the motor."

What were we looking for? In our meeting on September 28, 1960, Normal L. Dean claimed that the classical situation of a simple harmonic motion drive was incorrect. Classically, when the masses are displaced to their maximum extent to the right, for example, the carriage will be at its maximum displacement to the left. Thus the device operates with a 180-degree phase angle between weights and carriage.

Dean claimed that the motion of the carriage led the motion of the weights by 225 degrees, creating a "phase angle" of 45 degrees.

When simple harmonic motion is considered as the driving force in Davis mechanics, this phase angle does indeed appear . . . but not to the extent claimed by Dean.

With our oscillating device, we were looking for a phase angle. Hence the device was called the "Phaser Mark I", with due apologies to Gene Roddenberry because we were first.

Phaser Mark I Mod 0 was driven with a light 1/4-inch drill rod shaft, two light-duty Boston Gear universal joints which are also called "slipper joints", and a light-duty sleeve-type slip joint. I ran the device from 150 rpm to 1,500 rpm. I looked hard for a phase angle, so did Davis, Victory, Korff, and Campbell. We never saw the phase angle claimed by Dean using similar equipment. What I did succeed in doing was to tear hell out of those 1/4-inch slipper joints to the point where there was at least 15 degrees of slop in them, a disparity that would have rendered any observed phase angle meaningless.

So I created Phaser Mark I Mod 1 with a beefed-up drive train using 1/2-inch slipper joints, half-inch drill rod shaft, and really beefy sleeve joint.

At 1,500 rpm, just at the point where the Phaser was about to ear itself to pieces and scatter parts all over the room, I saw a three-degree phase angle.

Although this wasn't the magnitude of phase angle reported by Norman Dean, it cast serious doubt on classical theory which says that there should be no phase angle whatsoever!

I saw the three-degree phase angle several times. So did Bill Davis and E.L. Victory. To eliminate any source of error. I measured the total slack in the entire drive train; it was less than a half-degree.

To prove that this phase angle, which was real, was not a cconsequence of the rotating masses, I re-designed the Phaser to Mark II configuration. This used an oscillating mass, a single weight that vibrated horizontally back and forth driven by a small eccentric. The magnitude of its displacement was the same as that of the counter-rotating masses, and I maintained the same oscillatory mass and the same mass ratio as in Phaser Mark I.

With the oscillating weight of the Phaser Mark II vibrating back and forth at 1,500 cycles, the operation was a lot smoother, and I saw the good old three-degree phase angle just as before. It was highly repeatable. It was witnessed by Davis, Victory, and others.

The motion of the carriage led the motion of the driving force of the oscillating mass(es).

Looking back on this series of experiments with the Phasers, I now realize that it was probably the elegant experimental proof we were searching for. Victory's calculations said that our Phasers had a critical action time of a half millisecond. We should have built one with twice the dimensions to see if it had a CAT of a full millisecond, or at least a larger critical action time. If we had been able to predict the CAT, we would have had proof.

I believe our big problem was the fact that we had gained a large measure of respect--nay, downright fear--of the Phasers. The sight of that seven-pound Phaser shaking back and forth on a lab bench at 1,500 cycles was more than impressive. It shook the whole building when it went into resonance with the structure. And it kept trying to tear itself to pieces. I kept beefing it up. I can guarantee that when I got through with that drive train, it was strong. Although we should have taken the "American" approach of making it bigger, we abandoned the Phaser experiments. We figured that it would be easier to make measurements on a linear system instead.

So I designed a rocket-powered ballistic pendulum.

It consisted of two five-pound cylindrical masses separated by a 36-inch length of hardened 1/4-inch drill rod. The device was hung as a ballistic pendulum, initially eight feet long. On the rear mass, I mounted an Estes Type B14 solid propellant rocket motor that would produce a peak thrust of nine pounds 150 milliseconds after ignition and had a duration of 300 milliseconds. The mass of the rocket propellant used was less than one percent of the total mass of the pendulum. A Dynisco bonded strain gage load cell was mounted on the rear mass to measure the intantaneous throust of the rocket motor on the pendulum. This was read out on a high-speed Visicorder light-0beam oscillograph. A light trough was placed below the pendulum with a 300-watt spot light at one end of the trough. In each pendulum bob, a cadmium sulfide photocell looked straight down into the light trough, detecting the light gradient as the pendulum swung. The outputs of both photocells were fed into separate channels in the Visicorder. We calibrated this and discovered that it was a very sensitive pendulum position indicator.

When the rocket motor was electrically ignited, it pushed the pendulum horizontally. The thrust-time curve of the rocket motor was recorded along with the photocell output that was proportional to the pendulum position.

Theoretical calculations predicted that there should be a time delay between the instant that thrust was applied to the pendulum and the instant it started to move. Davis mechanics also predicted that there would be a discrepancy between how far the pendulum swung --- based on the total impulse imparted to it by the rocket motor --- in reality and how far it should have swung according to classical mechanics.

We chased bugs in that rocket pendulum for over two years. First, we moved it to a new lab at Stamford, CT, where it was re-hung from 16-foot lines. When we moved the lab again in Stamford, we again re-hung it as a 16-foot ballistic pendulum and developed an even more accurate capacitance position measurement system for it.

In all the hundreds of tests with the pendulum, we never detected what we were looking for. I know now that it was because the system was too small and that the rate-of-change of force imparted by the rocket motor was too low. We should have hit it with a 16-pound sledge instead. We didn't because I hit it with a one-pound hammer once, and broke a $150 load cell. In March 1965 when we finally made highly accurate position measurements with the capacitive position system, we learned that the pendulum vibrated in four degrees of freedom when the rocket thrust hit it. We had no way of accounting for all the energy that was leaving the system by means other than linear displacement. So the experiment was abandoned.

However, the rocket pendulum did put us wise at last to the critical test for all One-Way machines, Space Drive, Anti-gravity Devices, and their like. When the word got out that Huyck Research Center would listen to inventors and look at their machines, the fun began. I think that I have seen every sort of shaking, spinning, whirling, vibrating, buzzing, snarling, grinding space drive that the fertile imagination of inventors can dream up. I have seen ones that would climb a slight gradient because of the stick-slip frictional phenomenon. I've seen them scoot across the floor. I have seen them do all sorts of wonderful things except when we put them to the critical pendulum test.

For the benefit of any of you who may some day be confronted with a unidirectional drive, here is the Critical pendulum Test:

Suspend the unit freely as a ballistic pendulum shown in the drawing. The longer the pendulum, the more sensitive it will be to any unidirectional force. When the drive is turned on, it must displace itself from the vertical rest position. Furthermore, it must not vibrate back and forth about the rest position. It must displace its center of mass from the vertical and stay there as long as it is turned on.

Every space drive that we tested would not pass this test. The inventors were usually very embarrassed. 'Gee, it just started to work there when it came apart. I guess we're lucky that nobody was hurt when it blew up'. They all left, promising to fix the invention and return with it. Nobody ever did.

There is one highly unfortunate aspect to this. Because of the total recalcitrance of Norman Dean, we were never able to subject the Dean Drive itself to the critical pendulum test at Huyck Research Center.

It was once claimed that the Dean Drive did pass this test. John Campbell made a comment to a letter in bras Tacks in the November 1960 ASF as follows: 'Suspended from a flexible wire, the model will push itself away from the vertical and hang at an angle'. But I never saw it do that. I am very positive that Campbell never saw it, either, and that he was merely reporting what Norman Dean told him. Otherwise, Campbell would have made some very pertinent remarks during the many pendulum tests we ran not only with the rocket pendulum, but also with several One-Way Machines.

While I was involved in this frenzied, exciting, frustrating, enjoyable, disgusting, delightful and maddening experimental program, the CAT Pack wrote a scientific paper. Entitled 'Some Aspects of Certain Transient Mechanical Systems', Davis delivered it on April 23, 1962, at the Washington DC meeting of the American Physical Society. There were no comments. Why

didn't anybody hear this paper? Why wasn't it published? I don't know, but the APS and Physical Review turned it down for publication. I was given to understand that it was nearly impossible to get anything published that contradicted Einstein in the slightest degree, even in philosophical background.

Then as now, there were few avenues for published speculation in science and technology. Analog happens to be one of the few places where a person can toss a new idea to the wolves to see what happens. We knew this, so Davis wrote 'The Fourth aw of Motion' that was published in the may 1962 issue of Analog. Strangely, the article didn't draw the sort of comment that we had expected; perhaps it was because it contained a couple of partial differential equations.

However, the 1962 publication efforts did finally bring us into contact with an independent investigator.

On July 1, 1963, Hermann von Schelling at the Advanced Technology Laboratories of the General Electric Company in Schenectady, NY, published a paper entitled, 'Stochastic Approach to the Laws of motion'. He arrived at the same conclusions as the CAT Pack, but he did it by the statistical or stochastic method rather than by the Davis deterministic method. Von Schelling even went further to postulate a quantum of time, a time interval during which even the smallest subnuclear particle could not respond to a change in its energy. By von Schelling's method, this time quantum was calculated as 6.27 x 10^-24 seconds. When calculated by Davis mechanics, the same number came out. Furthermore, this led to the conclusion that the smallest unit of length in the universe was the distance that light could travel in that smallest unit of time, and worked out to 1.88 x 10^13 centimeters.

This number agrees with the estimate made in 1955-56 by Werner Heisenberg.

In late 1962, the CAT pack was joined by a most formidable international scientist, Dr Henri Coanda, inventor of the first jet airplane (1910) and father of the field of fluidics (the Coanda Effect). Using Davis mechanics, Coanda developed a rationale for both Reynolds Number and Mach Number.

In May 1963, Campbell published a letter from Norman Dean wherein the inventor explained in details his 'phasing' hypothesis and gave explicit instructions on how to build and conduct an experiment so that his data could be confirmed by anyone who wished to try it. The Dean experimental device described in that Brass Tacks letter was identical to the Phaser mark I. So, just to be on the safe side, I dug out the Phaser Mark I and had out two best lab technicians read Dean's letter, set up the Phaser, and re-run the previous Phaser Tests. Both C. Philip Morse and Maclane Tilton, our chief economic tech and chief mechanical tech respectively, conducted these tests without any supervision from Davis, Victory, or myself. I stood by in the background and just watched. Dean claimed they could see a 45-degree phase angle. They saw the 3-degree phase angle that I had seen.

E.L. Victory and I reported this in a letter to Brass Tacks that appeared in the September 1963 issue along with a photo of our Phaser Mark I. Norman Dean must have considered this as a personal attack on him, because he fired back a vitriolic letter to Campbell that was published in the January 1964 Analog. Dean accused us of all sots of things, including violation of his patent rights. This immediately brought in the Huyck general counsel and patent attorneys. I really wanted to go see Dean and get it straightened out. But, acting on the advice of the Huyck attorneys, Davis instructed me not to do so.

Since that time, I have carefully studied all of the Dean materials that have been published. What did Dean do to get his claimed 45-degree phase angle, and why couldn't we get it, too? Was he

using a heavy carriage with centering springs? Was his light quarter-inch drive shaft twisting? We had both used common universal joints, otherwise known as slipper joints, that are known to possess lobes of unequal torque and rate of angular rotation when deflected; did this have a significant effect? I wanted to build Phaser Mark III with constant-torque Rezeppa Joints, the sort they use in the front-wheel drive of Jeeps. Was my flywheel smoothing out something (Dean did not use a flywheel)?

We really don't know, but I strongly suspect that Dean's light-duty drive train had something to do with it.

We did a lot of theorizing about what a true space drive might be like and came to some interesting conclusions. First of all, if Davis mechanics has a shred of truth to it, the phase angle of Dean's device should have been dependent upon the rotational speed or cyclic rate, but the drive efficiency should increase as well. This meant that really good efficiencies could not be obtained with any device operating down in mechanical cyclic rates. It meant that a drive should be operated at megacycle or gigacycle rates.

We further came to the conclusion that the Dean Drive --- or any machine capable of producing a unidirectional force under the hypothesis of Davis mechanics --- would have to consist of a device that was one system during part of a cycle, and another system during the rest of the cycle. Or a device in which the initial system was deliberately destroyed during one part of the cycle and reassembled during the rest of the cycle.

There is only one thing that will really do this at megacycle rates and above: electromagnetic devices, gadgets based on plasmas and electromagnetic fields.

We thought about how to do this and how to build it. By April 1965, we were just about ready to start putting some experimental hardware together.

Then the nation's economy stumbled a little bit. An economy wave rolled over Huyck Corporation. And in any corporate economy drive, two things get cut back right away: advertising and research. When we came in the door of the lab on Monday, April 2, 1965, Bill Davis informed us that the research budget was no more, that the lab was closed, and all equipment was to be disposed of at once. All of us were given severance pay, letters of commendation, and the usual regrets.

Thus ended the only serious research program that I know of that was devoted to an analysis of the Dean Drive and an attempt to construct a theoretical foundation for such devices.

And it is a totally unsatisfactory ending because nothing --- nothing --- has been resolved. The work raised all sorts of questions. It brought together a lot of hitherto inexplicable facts and gave them some sort of rational foundation. It tied everything up in a neat bundle and just left it sitting there.

Item: The human body responds to rate-of-onset of acceleration, a third derivative force. USAF specs are still based on this.

Item: Stress is not proportional to strain. The classic law holds only under steady-state conditions in testing machines. Under conditions of high-rate loading, the stress-strain curves behave quite differently. Cables snap. Yokes break. The noses of armor-piercing shells hammer their way through armor while the back end of the same shells proceeds inexorably forward, not knowing that the front end is hammering away.

Item: The mundane industrial operation of squeezing water out of paper and felt is totally dependent upon the rate of onset of the force in the press roll nip; the application of the

principles of Davis mechanics to paper mechanics permits the system to be changed so that the machine can run faster.

Item: Newton didn't have the instruments to measure high-rate phenomena. Newtonian mechanics is steady-state mechanics. Even at that, any engineer will tell you all about the Finagle Factors…

Item: Newtonian mechanics is true only if the energy of a system can be changed in either zero time (which is not a reasonable assumption) or in a time interval long enough for the entire system to react as a whole. Davis mechanics would merely elaborate upon Newtonian mechanics to include the starting transient, the high-rate case, the situation in which the system is so great that part of the system does something while the other is doing quite something else.

Item: The harder they hit the atomic nucleus with particles in high-energy accelerators, the greater the rate of change of energy… and the greater the number of wild, wonderful, and unsuspected particles that are generated. It is really difficult to account for all of these new particles… except in Davis mechanics where they would be viewed as a consequence of rate-of-change: the energy that the particle system cannot absorb and must then leave the system.

Item: With several very, very intelligent and respected scientists involved in the program, we never once ran up against a flaw in the logic, a trivial consequence, an irrational conclusion, or any result that did not appear to jibe with the real world.

Item: Nobody has yet designed and conducted the elegant experiment to either prove or disprove the hypotheses of Davis mechanics.

Item: Nobody has ever conducted a series of critical, objective tests on the Dean Drive. The Dean Drive has never been subjected to the pendulum test described herein except as reported by John Campbell and never verified.

Ladies and gentlemen, there is unfinished business here that gets worse every day. Norman Dean passed away in the late 1960s. John Campbell died on July 11, 1971. Dr Henri Coanda died in November 25, 1972. And Dr William O Davis died on may 10, 1974. Korff, Victory, and myself appear to be the only ones left who participated in this most exciting work.

I saw the Dean Drive work, and I think I know how and why it worked. I don't know if it would pass the pendulum test, but the test must be made before anyone has the right to sit back and be smug --- on either side of the fence.

Until the basic hypotheses of Davis mechanics are either proven or disproven, the nagging specter of the space drive will haunt our scientific community. Will it or won't it? Is a space drive possible or not?

If it is impossible, what pushed against my hand?

If it is impossible, what was the 3-degree phase angle that I saw with the phaser Mark I and mark II?

I am not talking about Dianetics, Psionics, or ESP. This is physics and engineering and technology. It would take so little time and so little money to find out whether we have nothing… or…

There is an unpublished series of papers written by Davis and the rest of the CAT Pack. They hypothesize a theory of inertia and gravitation that embrace both Newton and Einstein. Based on very preliminary calculations, the theory based on Davis mechanics indicates that the speed of gravitational propagation is at least 30,000 times the speed of light.

The end of this article remains to be written.

References

1 --- Norman L. Dean: US Patent # 2,886,976, System for Converting Rotary Motion into Unidirectional Motion.

2 --- J.W. Campbell: Private communication to G.H. Stine, August 21, 1959.

3 --- John W. Campbell: 'The Ultrafeeble Reactions', Astounding Science Fiction, 64(4): 6, et seq., December 1958.

4 --- J.W. Campbell: 'The Space Drive Problem', Analog 65(4): 83-106, June 1960.

5 --- J.W. Campbell: 'Report on the Dean Drive', Analog 66(1) :4-7, September 1960.

6 --- J.W. Campbell: 'Instrumentation for the Dean Device', Analog 66(3): 95-99, November 1960.

7 --- William O. Davis: 'The Fourth Law of Motion', Analog 69(3): 83-104, May 1962.

8 --- W.O. Davis: W.O. Davis, et al.: 'Some Aspects of Certain Transient Mechanical Systems', Amer. Physical Soc. Paper FA10, 1962 Spring Meeting, Washington DC, April 23, 1962.

9 --- H. v. Schelling: 'Stochastic Approach to the Laws of Motion', General Electric Company Report No. 63GL106, Advanced technology Laboratories, July 1, 1963.

10 --- N.L. Dean: Letter, Analog 71(3):4, et seq., May 1963.

11 --- G.H. Stine, E.L. Victory: Letter, Analog 72(1): 4, et seq., September 1963.

12 --- N.L. Dean: Letter, Analog 72(5):92, et seq., January 1964.

13 --- W.O. Davis: Private laboratory notebook from September 30, 1960 to July 7, 1961.

14 --- W.O. Davis: 'The Huyck Dynamic Systems Research Program: Theoretical Background, Experimental Work, and Some Implications'; unpublished Huyck Corporation report, circa 1961.

15 --- W.O. Davis: 'Some Unusual Implications Inherent in the Huyck Dynamic Systems Research Program'; unpublished Huyck Corporation report, circa 1961.

16 --- W.O. Davis: 'The Energy Transfer Delay Time'; Annals of the NY Acad. of Sciences 138: 862-3, Article 2, February 6, 1967.

***Analog* 66 (3): 95-99 (November 1960)**

Instrumentation for the Dean Drive

John W. Campbell

The photographs on the preceding pages show some of Norman Dean's original instrumentation for his research on the Dean drive system

It is freely agreed by all concerned that bathroom scales are an inadequate form of instrumentation; it was never considered that they were proper scientific devices. The instrument setup shown is what Dean himself built and used in his research, a number of strain-gauge systems are incorporated into its structure, and associated strain-gauge amplifiers were used to produce the oscillogram shown.

For the information of those who 'explained away' Dean's results in terms of nonlinear response of bathroom scales --- the explanation doesn't hold. Strain gauges show the effect. But strain

gauge readings are meaningful only when you have, yourself, studied the precise method of installation, and have, yourself, calibrated them in situ.

What Dean was seeking, and never succeeded in getting any government bureau to do, was to give his device a test on their strain gauge setups. The sole point of the bathroom scale was to give a rough indication that there was something there worth taking the trouble to test for properly. The glitter of yellowish particles with metallic luster in a piece of quartz rock doesn't prove you've found a gold mine --- but it does suggest it would be worth your while to make a proper test.

None of the government agencies, up to the time of the issuance of the patent, had even bothered to study Dean's own strain gauge records.

The quality of workmanship in Dean's instrumentation suggests that his work of measurement was not sloppy or ill-considered.

This instrument setup was designed and built solely as a test instrument, to explore the essential principle of the Dean System.

There have been complaints that I did not adequately discuss the Dean device, but talked only about its rejection. There's a reason --- a good one. The Dean gadget is, mechanically, a very simple contraption. But the theoretical structure underlying it is decidedly not simple; I was fully aware that it was completely impossible to discuss the thing at all adequately in anything less than a full-scale thesis, and therefore skipped the thing entirely.

Put it this way; if I had stated, in 1935, that nuclear energy could be released very simply by just dissolving some uranium sulfate or nitrate in water, you can imagine the reception that statement would have gotten. Yet that statement is precisely and literally correct! That's a literal description of the Los Alamos Water Boiler Reactor. It's true that you need U-235-enriched uranium sulfate, and, or heavy water… but the statement is an exactly correct description of the simple way in which nuclear energy can be released.

I could, also, have stated, 'You need only pile up some blocks of graphite and lumps of ordinary uranium metal, or uranium oxide, and you will release atomic power'. That, too, is an exact and literal description of a true nuclear reactor --- the famous original Stagg Field reactor.

Each of those devices was mechanically an extremely simple thing… but there was a tremendous background of highly sophisticated research and design underlying them.

When I first hearth of the atomic pile, my reaction was, 'Why… someone might have stumbled on that thing accidentally!'

No, no once would stumble on it accidentally. It's true that naturally-occurring uranium can be used in the Fermi type moderated reactor… but only very, very specially hyper-purified uranium, and the graphite must be a very, very special hyper-purified graphite. It'd never happen that way by accident. Vanadium is one of the worst neutron-absorbing impurities,,, and vanadium is normally heavily laced into uranium ores. Most of the pre-WWII production of uranium in this country was the by-product of mining vanadium ores. In addition, graphite is commonly produced from petroleum residues… and vanadium is a common contaminant.

Again, a transistor is an extremely simple device. It consists simply of a tiny wafer sliced from a lightly impure germanium or silicon crystal, with three wires soldered to it.

Now let's see you go home and make one!

'Why, if it could be done as simply as that, someone would have done it years ago!'

Oh, yeah?

It is absolutely true that all you need to do to release atomic power is to dissolve a few pounds of uranium nitrate in water.

Dean's device is only mechanically simple.

Since my last report on the progress of Dean's gadget, one of the very large corporations that tackled the thing has made a complete theoretical analysis of the concepts. They find that Dean's mathematical structure is perfectly valid; their math-physics department agrees, after giving it a full run-through on a large computer, that he definitely can get force and energy output as he states. The one problem they can't nail down is how to show that he can feed force and energy into it; that problem arises because they have no satisfactory criteria for determining what frame of reference should be used in discussing the problem.

I've seen a short --- and admittedly rough --- mathematical analysis of the problem done by an engineer friend that, in essence, comes up with this answer: The centrifugal force generated in one sector of the rotation in an upward direction comes out exactly equal and opposite to the force exerted, in the rest of the cycle, in the downward direction. This, in other words, complies in full with Newton's equal-and-opposite law. If you break off the analysis at that point, you have a mathematical proof that Dean's device does not produce a drive.

The fault in the 'proof' is that while the two forces are equal and opposite, they do not have equal duration. The forces are equal and opposite…but the impulses are not. If that inequality is as small as one percent, then if you generate a centrifugal force of 100 G --- which is easy to do! --- you have a 10 G net.

Of the oscillogram, Norman Dean says: 'Please disregard the top light line caused by exterior interference. The top heavy line is zero force exerted by the oscillator in its free condition in each cycle. The next line down represents the cyclical re-setting force or reaction. The distance from the zero line to the bottom line is the amount of positive thrust exerted in each cycle. The two lower lines are of exactly the same time duration in each cycle, in this case 55 degrees of rotation. We therefore find that the net thrust in each cycle was the difference between the two lower lines. The picture is a time exposure of about ten cycles'.

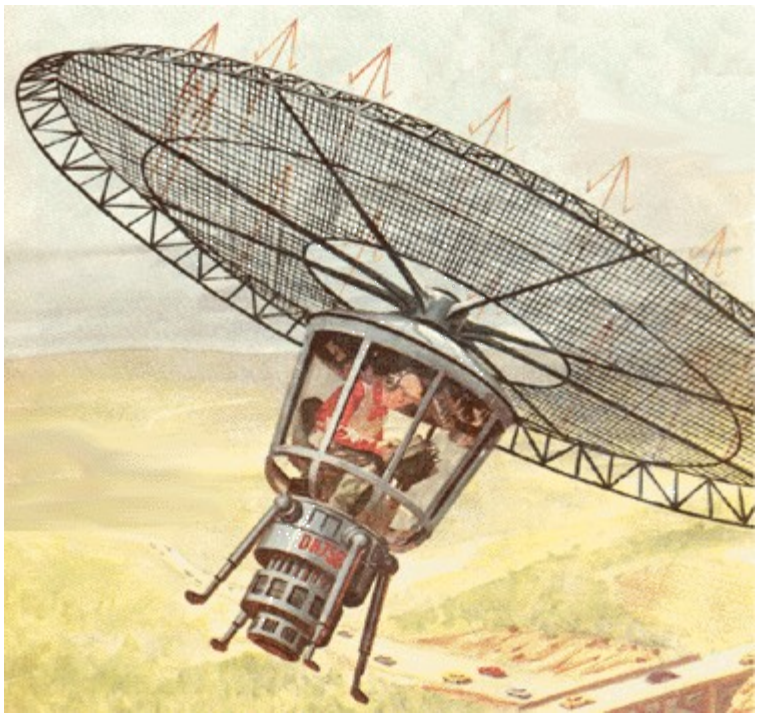
Major DeSEVERSKY Ionocraft

Popular Mechanics **(August 1964)**

Major De Seversky's Ion-Propelled Aircraft

by Hans Fantel

An ion-generated wind will lift and propel this incredible magic carpet of the future



It was downright spooky. Without a sound, the peculiar, spiky contraption rose straight up, hovered awhile, climbed higher. Then it did a few graceful turns, stopped again, and just sat there silently in midair.

It seemed like levitation --- some trick to overcome gravity. I could not shake off the feeling that I was attending a kind of spiritual seance, or maybe a Buck Rogers show, instead of an engineering demonstration. The eerie scene took place in the big barn like laboratory of Electron-Atom Inc., research firm in Long Island City, New York, devoted to the development of a new kind of flying machine. I had been invited to watch a scale model being put through its paces by remote control. What we saw was by far the oddest aircraft since the Wright Brothers' motorized kite.

It had no prop. No jet. No wings. In fact, it had no moving parts at all looking somewhat like an old-fashioned bedspring, the rectangular rig is the nearest thing to a magic carpet. It needs no runway, takes off vertically and is expected to climb as high as 60 miles. It can crawl through the air like a snail, or go faster than a jet. Nobody yet knows the speed limit.

After a while, I closed my mouth. But David Yorysh, one of the project engineers, noticed my puzzlement.

"Any questions?" he grinned.

"Yes. What holds it up?"

"Ions," said Yorysh, as he launched into an explanation of a wholly new flight concept.

The magic carpet, called the Ionocraft, flies on pure electricity. It depends specifically on the fundamental principle of electricity that electric current always flows from negative to positive, and it uses two basic pieces of equipment to take advantage of this principle --- tall metal spikes that are installed above an open wire-mesh grid.

High negative voltage is shot from the spikes toward the positively charged wire grid, just like negative and positive poles on an ordinary battery. As the negative charge leaves the spike arms, it peppers the surrounding air like buckshot, putting a negative charge on some of the air particles. Such negatively charged air particles are called ions, and these are attracted downward by the positively charged grid.

"Okay," I said. "But I still don't see what holds it up." "I'm getting to that," Yorysh assured me as he spelled out the rest of the Ionocraft principle. In their mad rush from the ion emitter to the main grid, the ions bump into neutral air molecules-air particles without electric charge.

The terrific wallop in these collisions hurls a mass of neutral air down-ward along with ions. When they reach that air grid, the ions being negative are trapped by positive charge on the grid. but the grid has no attraction for the neutral air particles that got bumped along. So the air flows right through the open grid mesh, making a downdraft beneath the Ionocraft. The contraption rides on this shaft of air, getting lift just like a helicopter --- by sucking air down from the top.

"Aerodynamically, it works just like a chopper," Yorysh summed it up. "But instead of using a rotor and blades, we create the downward air flow electrically by means of ionic discharge. The ions act on the air like a man treading water. They just push down."

The engineers working on Ionocraft are the first to admit that their present rig is still a long way from any kind of practical aircraft. The model we saw measures only 1296 square inches and consists of about $5 worth of balsa wood and aluminum wire. But the principle holds an important promise for the future of aviation.

The problem now is improving efficiency --- getting enough lift from a given grid area and a given amount of energy, Present models cannot yet lift their own electric generators. they get power through a feeder cable, dangling down like an umbilical cord. Ionocraft engineers tend to be close-mouthed on performance figures.

But they will tell you that at present it takes 90 watts (30,000 volts at 3 milliamperes) to fly a two ounce model. Translated into ordinary power-to-weight ratios, this works out to roughly 0.96 hp. per pound, as compared with a typical 0.1 hp per pound of helicopter or 0.065 hp for a pound Piper Cub.

But Ionocraft designers are hard at work upping efficiency. One possible power --- boosting technique is to pulse the power in short high energy bursts rather than apply steady voltage. They are also trying out various grid patterns and ion emitter layouts to minimize energy loss through turbulence in the downdraft.

Despite such unresolved problems, the development crew almost bristles with optimism, and the most optimistic of all is the Ionocraft's inventor Major Alexander P. de Seversky. No crackpot, Major de Seversky is a practical visionary who in many areas has been far in front of his field.

"We hope to fly a model with self-contained power, perhaps by the end of the year," he told me, confidently.

"Ultimately, the ionic drive will prove more efficient than either propeller or jet as a method of aircraft propulsion.

"It will achieve lift at less expenditure of energy and fuel than existing form of aircraft. In fact, it will prove the most efficient method of converting electricity into motion."

Coming from a man of de Seversky's background, such a statement has an almost prophetic ring. A leading aircraft designer and ace flyer for the past 50 years, de Seversky's ideas have often been ahead of their time-sometimes to the embarrassment of other aviation experts. Losing his

right leg during his first flying mission in World War I didn't deter him from downing 13 enemy aircraft in later flights. After coming to the United States from Russia, de Seversky developed bombsights and course computers during the 1920s that were the forerunners of today's inertial guidance systems.

Worked with Billy Mitchell ~

Later he pioneered the design of the cantilever-skin stressed wing that is now in general use. He was consultant to General Billy Mitchell in the historic airplane-versus-battleship tactical experiments of the 1920s, and as a special consultant to the U.S. Chiefs of Staff helped formulate basic air strategy in World War II. He also contributed to the designs of the P-35 and P-43 which led to the development of the P-47 Thunderbolt, one of America's most effective wartime fighter planes. Now a trim and sprightly man of 70, he still likes to take out experimental jet planes for a spin.

"The idea hit me as I was working on an electric air-cleaning device which I had invented," the major recalled.

"That gadget was designed to fight air pollution by electrically charging the particles in industrial smoke and then trapping them on a liquid electrode with the opposite charge."

De Seversky noticed an air flow developing between the two electrodes, caused by ionization process previous explained.

"To an old flyer like me," said the major, "anything that stirs up a wind is a flying machine. So I began to develop the idea." The major seemed concerned that the Ionocraft might be mistaken for a kind of space vehicle.

"This is not a spacecraft," he explained emphatically to forestall any misunderstanding. "It's an airplane, designed to operate within the atmosphere. But it will be able to do things no present type aircraft can accomplish."

Pointing out the potential advantage of Ionocraft over conventional planes or helicopters, de Seversky ticks off a whole string of radical notions:

High-altitude flight --- Helicopters whirl their blades in utter frustration at altitudes where the air gets thin. Beyond 20,000 feet, they get almost no lift. By contrast, experts calculate that Ionocraft can kick up (rather kick down) enough air to stay aloft at 300,000 feet.

Unlimited size --- The bigger it gets the better it flies. Efficiency increases with grid area. Distributing airflow around the grid edge becomes proportionately less important in larger craft. The reason:

Grid area increases faster than circumference with growing size.

"We'll be able to build them as big as a city block" claimed de Seversky.

High speed --- No practical speed limit has been determined. The ions themselves flash from emitter to grid impart to the very high-velocity impulse. Aerodynamic drag would be the chief speed-limiting factor. But, streamlining of the grid edge and careful contouring of the craft, could minimize air drag.

Safety --- No moving parts in propulsion and no wear, means less chance of failure, simpler maintenance.

Steering with Voltage ~

Steering control is accomplished by applying different voltages to various parts of the craft. The part with the high voltage gets more lift, hence tilts up. The form of the Ionocraft does not matter. Any shape will fly, but de Seversky assumes that round models in the form of a flying saucer will be the most easily manuverable.

By a simple joystick control, the pilot can lift any edge of the craft, producing pitch and roll as if the Ionocraft had elevators and ailerons. He can put the craft into any flight attitude-noise up or down, or banking to either side. Like the tilt of a helicopter rotor, this inclination pushes the craft forward, rearward, or sideways.

J.F. Bruno, the technical director of de Seversky's staff, spoke of a passenger gondola in future models, suspended from gimbals below the main grid so that it remains level regardless of how the main deck is tilted. Locations below the main grid also shields passengers from high energy flow. But, even if the passengers somehow got into the ion stream, it wouldn't electrocute them unless they got "grounded" to the main grid. "It would be just like birds sitting on a wire," said Yorysh, the man in charge of electronic design.

Until patents for Ionocraft were firmly nailed, de Seversky kept his ideas carefully under raps. That's another reason no full-scale prototype has yet been built. But even present scale models set the imagination buzzing. Manned craft are envisioned for:

Commuter transport --- With no size limit, you can pack trainloads of people into this VTOL craft, relieve traffic congestion around urban centers. The type of craft used as long-distance transport possibly at supersonic speeds- would not need big airports with long run ways.

Airborne traffic monitors --- Hovering above bridges and major intersections, or patrolling above highways, one-man Ionocraft would provide a panoramic view of traffic conditions, radio information to ground traffic-control centers.

Grid Is Hard to Hit ~

Military reconnaissance and rescue --- Without moving parts, the Ionocraft is less vulnerable to small-arms fire than helicopters. The open grid makes a poor target. Most bullets would whiz right through it. Even if the grid is hit, the electric charge would be maintained despite the damage to some portions. Unlike a copter with shattered blades, the Ionocraft would not crash.

Weather observation --- While satellites like Tiros look down on the atmosphere from outer space. Ionocraft could sail right into the weather-making air layers, providing valuable supplemental information. Being steerable, Ionocraft would not drift with the wind like weather balloons, but could hold a position over crucial areas, making local forecasts more reliable.

Skyborne antenna, kept aloft indefinitely in a fixed position by ground based energy supply. Ionocraft could also act as a skyborne antenna, extending the range of defense radar. "It would be like raising the DEW-line 60 miles up into the air," suggested de Seversky, "adding 15 to 25 minutes warning time against missiles."

Anti-missile machine --- Always alert to military tactics, de Seversky believes that Ionocraft could be used as missile interceptors. Normally the craft would hover at high altitudes, scanning the horizon for a 700-mile range. As soon as it spotted and identified a hostile missile through an infrared detection system, the Ionocraft would hurl itself at the enemy rocket on a collision course and blow it out of the air.

When practical craft are built, their designers expect to have a choice of several power supply systems now under development for NASA's space program. Some of these include:

Gas-turbine generators --- Several firms, notably General Electric and Allis-Chalmers, have come up with compact, light weight, kerosene- fueled turbines, originally intended as power sources for spacecraft. These may be used to generate electricity aboard Ionocraft.

Fuel cells--- These are chemical reactors producing electricity like a storage battery, but drawing their chemicals from external supply tanks. NASA is currently testing fuel cells converting hydrogen and oxygen to electricity, with drinking water as a byproduct.

Solar cells directly convert sunlight to electricity-the present energy source of most satellites. When high-efficiency solar cells are available, they may keep Ionocraft aloft for indefinite periods.

Power From Boiling Mercury ~

Sunflower --- A code name for another project aimed at deriving electric power directly from sunlight. It employs an umbrella-like reflector that focuses the sun's heat to boil mercury, which expands through a turbine and drives an electric generator (Solar-power supplies would be back-stopped by other kinds of power generators to take over whenever no sunlight is available.).

Microwave radiation --- Concentrated beams of high-frequency radio waves may transfer energy from ground stations to the Ionocraft if the craft is to be used as a hovering platform in a fixed position. Raytheon has pioneered this type of energy transmission through its Amplitron tube and has recaptured as much as 72 percent of the radiated energy at the receiver site. High-power laser beams may be similarly used for transmission.

Experimental hardware has already been produced for each of these off-beat power-supply systems.

None of the men working on the Ionocraft will be pinned down to any production timetable. "It's a pretty wild project," admitted technical director Bruno, a veteran 20 years in the missile business. "But that's what they said when we started working on rockets."

Major de Seversky, whose own career goes back to the beginnings of aviation, views his invention in historical perspective:

"We are exploring an entirely new principle of flight. We're just at the spot where the Wright Brothers were in 1903. We are just beginning to see the possibilities."

Ion-propulsion is produced when negative charge from upright arms charges surrounding air particles into ions. Negatively charged ions rush toward positively charged grid, pushing neutral air particles before them.

Figure 1 ~ Ions rushing towards positively-charged grid collide with neutral air molecules and thrust air downward. Ions stop at grid. Neutral air molecules, whacked downward by ions, pass through mesh of ion-acceptor grid. Downwash keeps Ionocraft aloft.

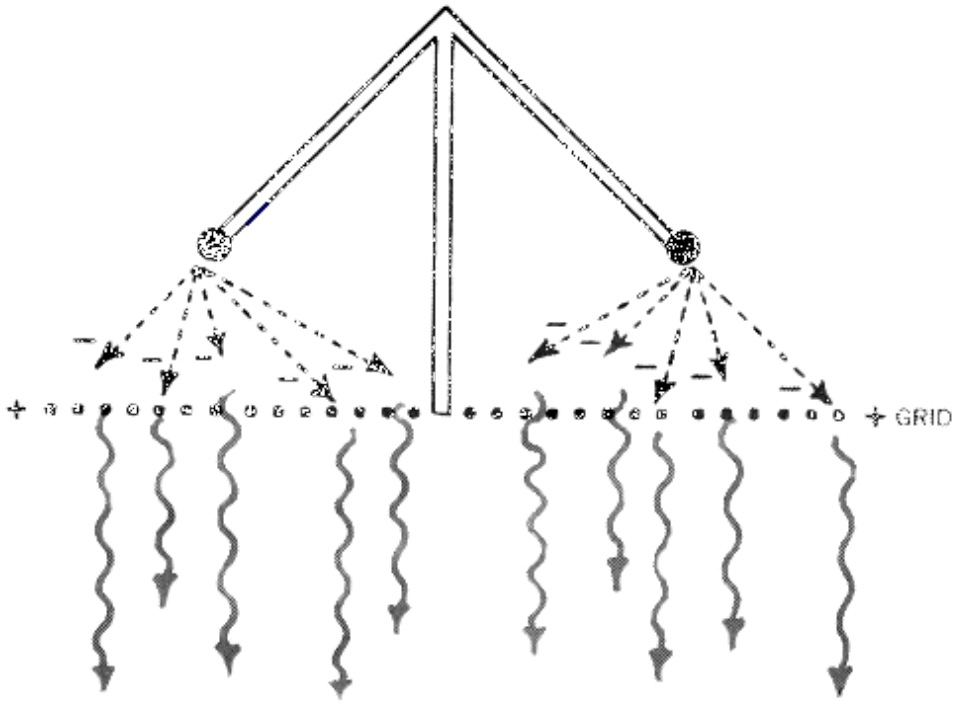


Figure 2 ~ Major DeSeversky became interested in ion propulsion when he noticed air flow between two electrodes while working on another of his inventions.

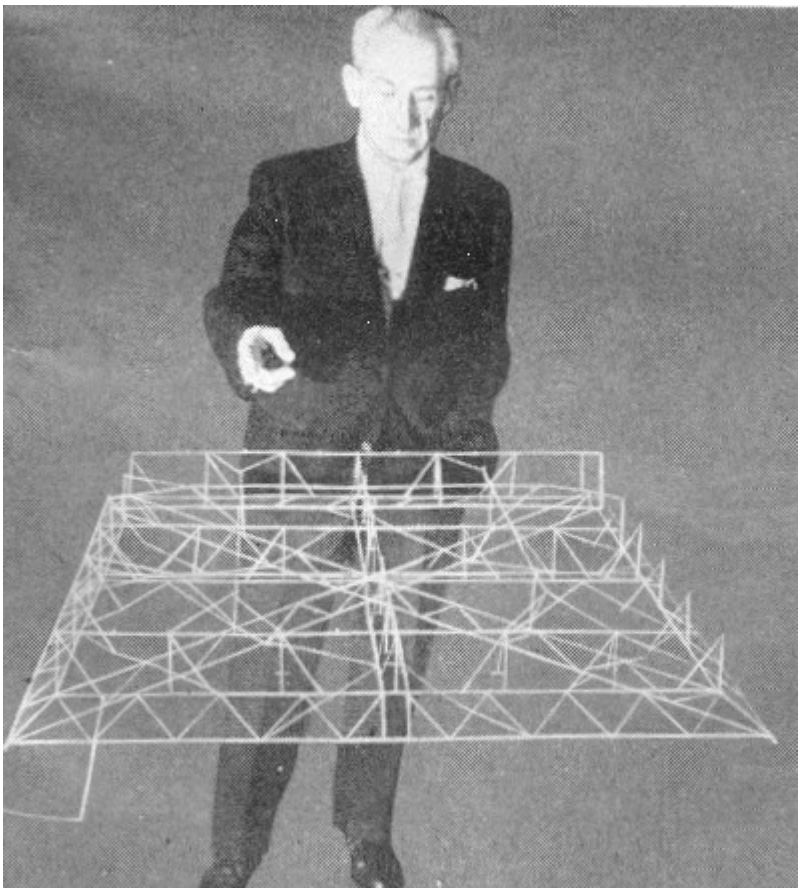


Figure 3 ~ Ionocraft model takes to air, completely unsupported except for downwash of air. Next step is to develop a model that can carry its own power supply

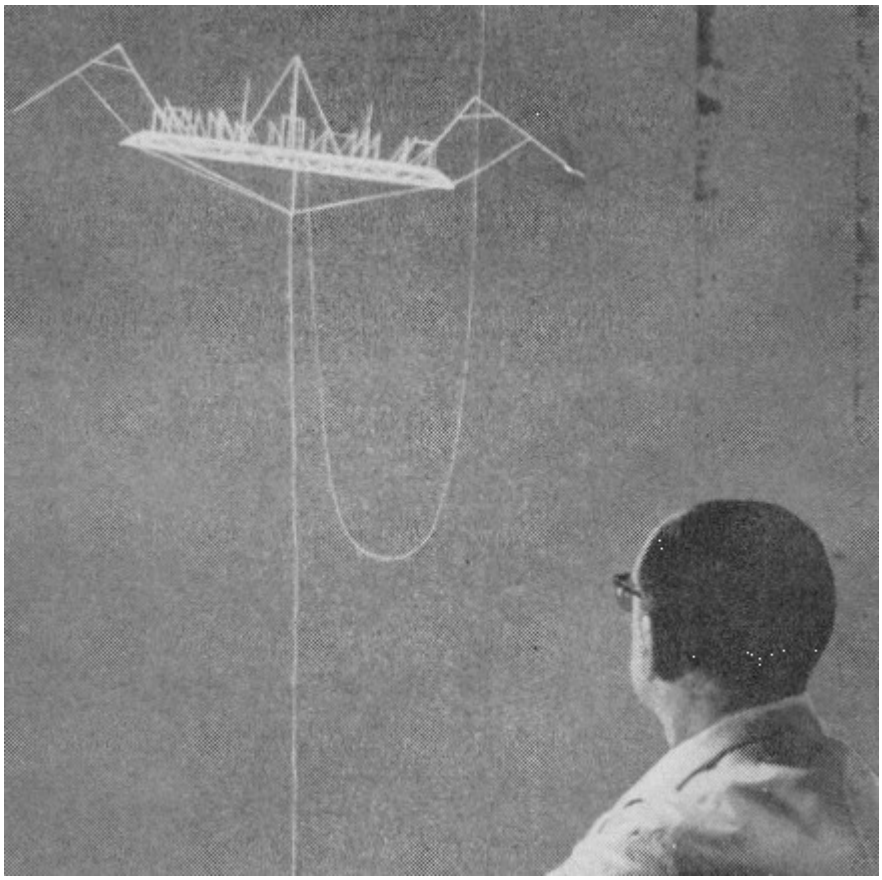


Figure 4 ~ Ionocraft Commuter maybe solution for suburbanites of the future in congested areas, speeding hundreds of them short distances over heavy city traffic. Power would be supplied by chain of ground-based master stations.

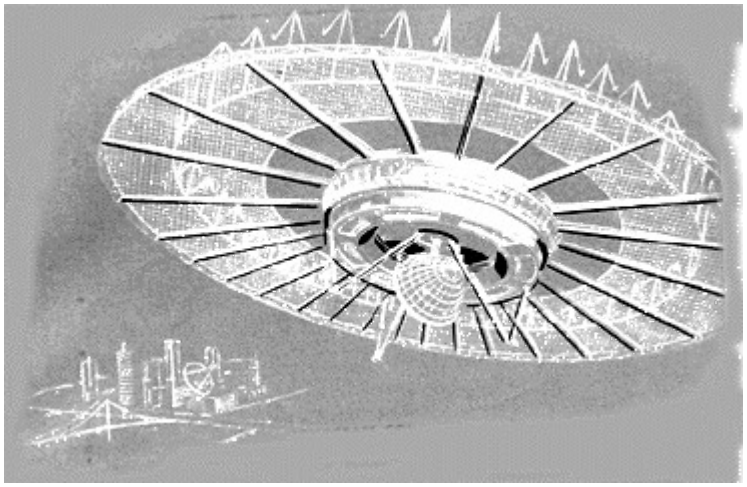


Figure 5 ~ One-Man Ionocraft could be tomorrow's traffic patrol car or, in combat, hovering vehicle for guerrilla wars, all but impervious to some minor grid damage.

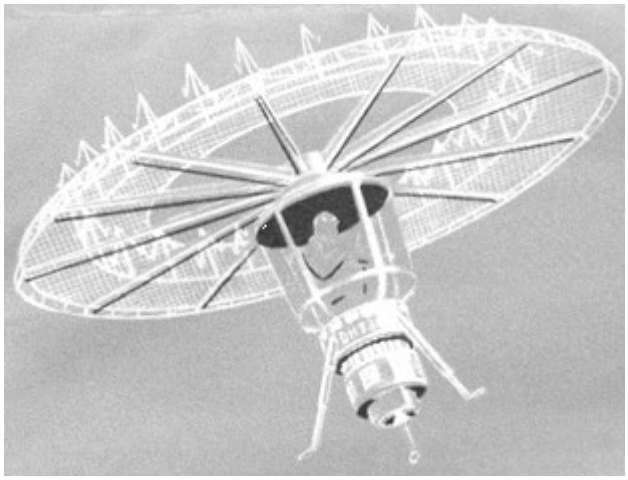
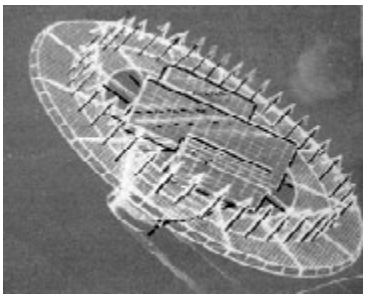


Figure 6 ~ Anti-missile ionocraft, powered by sunlight, could hover indefinitely in upper atmosphere, then home in on an incoming warhead and blast it out of the sky.



US Patent # 3,130,945

(April 28, 1964)

Ionocraft

Alexander P. de Seversky, New York, N.Y., assignor to Electronatom Corporation, New York, N.Y., a corporation of New York.

Filed August 31, 1959, Serial Number 837,150
29 Claims. (CI. 24~ 62)

References ~
US Patents ~ 2,495,748 ~ Matson (Jan. 31, 1950) ~ 2,503,109 ~ Harris (Apr. 4, 1950) ~ 2,598,064 ~ Lindenblad (May 27, 1952) ~ 2,613,887 ~ Woods (Oct. 14, 1952) ~ 2,842,645 ~ Dalgleish, et al (July 8, 1958) ~ 2,888,189 ~ Herb (May 26. 1959) ~ 2,892,949 ~ Hardy (June 30, 1959) ~ 2,949,550 ~ Brown (Aug. 16, 1960)
Foreign Patents ~ 1,174,334 ~ France (Nov. 3, 1958)

This invention relates to improved heavier-than-air aircraft, and more specifically to structures which are capable of either hovering or moving in any direction at high altitudes by means of ionic discharge.

The present invention is an improvement over well known electrostatic generation of winds used in a novel manner to supply propulsion and sustenance forces for a heavier-than-air aircraft.

Crafts of the types heroin disclosed having effective areas of several square feet have been successfully flown and contemplated platforms will inherently be of large size since the lift force is proportionate to the area through which large quantities or masses of air are accelerated downwardly from discharge electrodes to collection electrodes, the latter being a meshed screen, bars, strips or any other structure that provides maximum collecting electrode area with perforations, slots or other types of opening to allow the air to pass through with a minimum of drag. Such a craft will be referred to in this application as an Ionocraft.

Such Ionocraft may serve as platforms which would be stationed above the earth for long periods of tinge and serve other purposes as will be explained below. The output power from microwave generators, such as magnetrons, coupled with high power capacity amplifier tubes may be beamed to the Ionocraft while airborne or the craft may carry its own power supply.

A principal object of the present invention is to provide a novel Ionocraft with space provided by the structure, preferably at the center of the craft, for installation of electronic equipment, and for the power plant, and crew where used.

Another object is to provide a novel Ionocraft construction wherein lightweight reinforcing members are provided to form a structure sufficiently rigid to cope with the dynamic and static loads and to maintain a desired distance between discharge emitting wires and the collecting grid.

Still another object resides in the novel configuration and arrangement of the emitting wires to assure uniform spacing from the collecting grid and to provide a maximum number of ionised particles for producing the desired lift.

A further object is to provide an improved Ionocraft of the foregoing type wherein some structural formation such as dihedral is provided for stabilising the craft during flight. The dihedral may be positive or negative depending upon whether the hovering flight or horizontal motion of aircraft is a primary consideration of performance of the craft. A multiple deck structure may be used where desired to increase the lifting force, and dihedral may be provided in two or more angularly related directions to provide stability in all directions. A conical shape with the apex or nadir at the top or bottom center may also be advantageously used.

Still another object is to provide auxiliary ionic discharge structures mounted for relational movement which are oriented to provide a horizontal propelling force and steering forces which can change the direction of the craft. By mounting such auxiliary structures to turn about a vertical axis, the craft can be made to turn in a horizontal plane about a vertical axis passing through the craft to thereby provide a scanning or target searching apparatus. A similar scanning motion can be achieved by mounting the auxiliary structures to turn about a horizontal axis.

A further object of this invention resides in the provision of a novel stick control using variable electrical impedances for control of the posture and for manoeuvring the craft through variation of the voltage applied to different portions of the craft.

A second principal object of the present invention is to provide a combination Ionocraft and antenna system for radio frequency energy wherein the structure of the Ionocraft is so arranged as to serve in whole or in part as a structure of an efficient electromagnetic antenna system. In accordance with this object of the invention, the device contains one or more antennas that may be used for communication signal transmission, for detection, tracking and/or identification and for eventual destruction through collision of oncoming airborne or space vehicles or missiles and the like. The Ionocraft structure may be used, for example, as the main antenna element, as a series of directing or reflecting elements or as a parasitic element and may be shaped to provide

arrays parabolas, corner reflectors, horns or lenses and be adapted to trans-mit a single or complete spectrum of frequencies from the extremely low frequencies to the highest frequencies including infrared.

Another object of this invention is to provide a com-bination antenna-Ionocraft with scanning means for detecting and/or tracking airborne vehicles or missiles. Such combination may also include suitable servo-control and other conventional equipment either on the Ionocraft or at a nearby ground station for causing the Ionocraft to "lock-on" automatically and/or be guided into the path of an "oncoming" vehicle or missile.

A further object is to provide an antenna which constantly locks on a radiation beam, such as a microwave or light beam for example, projected from the ground or from an aircraft in flight to change the position of the Ionocraft in flight.

These and other objects of the invention will become more fully apparent from the claims, and from the specification when read in conjunction with the appended drawings wherein:

FIGURES 1 and 2 are top plan and elevation views of the basic structure of an Ionocraft made in accordance with the present invention; FIGURE 2a is an enlarged pictorial view of a portion of the structure showing how the grid wires are connected to the frame members;

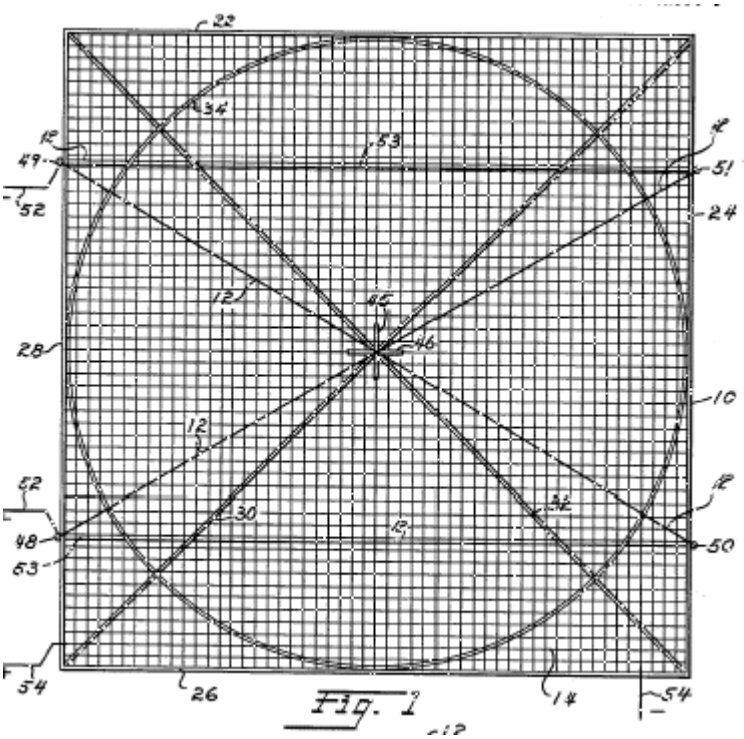


Fig. 1

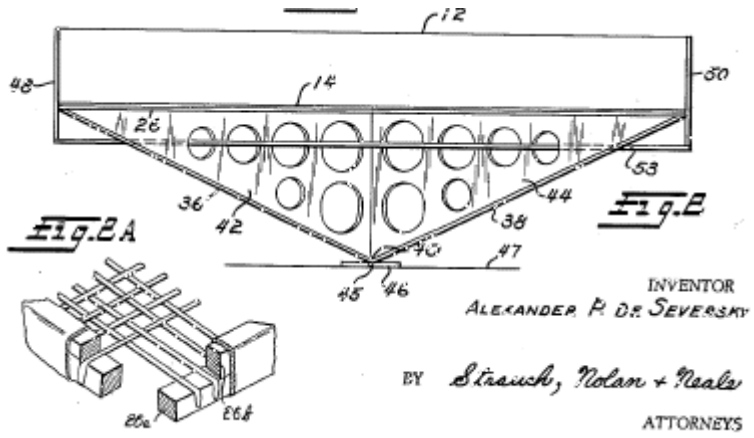


FIGURE 3 is a pictorial view of a modified, form of basic structure;

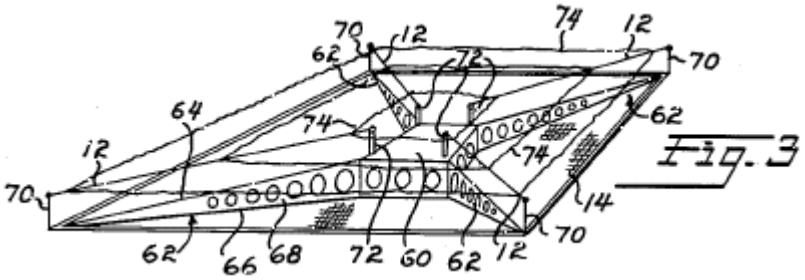


FIGURE 4 is a view in elevation of an embodiment similar to that shown in FIGURE 3 which is equipped with dihedral;

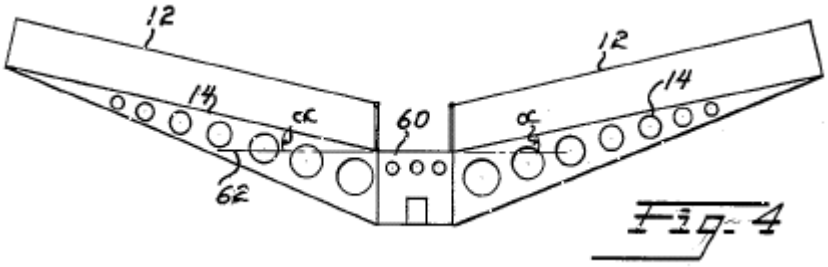
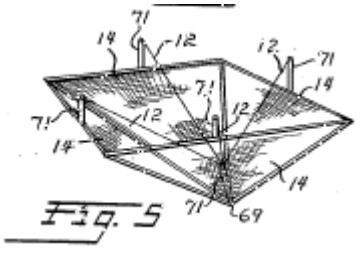


FIGURE 5 is a schematic view of a craft equipped with dihedral in two perpendicular directions;



FIGURES 6 and 7 are top plan and side elevation views respectively of a further embodiment of the present invention which is equipped with negative dihedral;

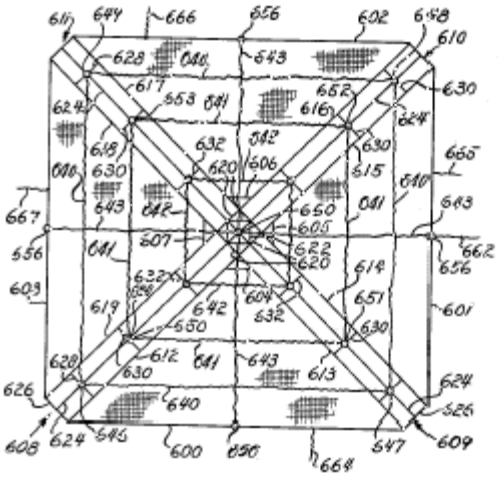


Fig. 6

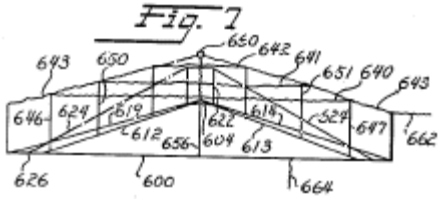


Fig. 7

FIGURE 8 is a cross section of collecting grid structural members which may be used in lieu of the wire mesh;

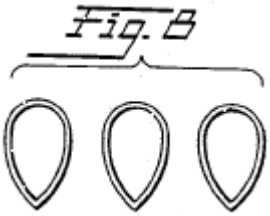


Fig. 8

FIGURE 9 is a view in elevation of an emitting wire having short wires suspended from the main wire to provide a point source for ion emission;

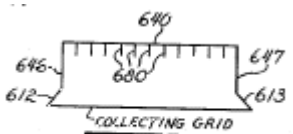


Fig. 9

FIGURE 10 is a diagrammatic view in elevation of an Ionocraft in accordance with this invention;

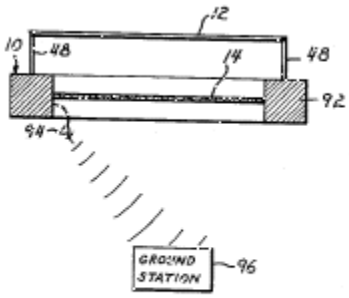


Fig. 10

FIGURES 11 and 12 are top plan views of two embodiments of the Ionocraft having a side elevation view as illustrated in FIGURE 10;

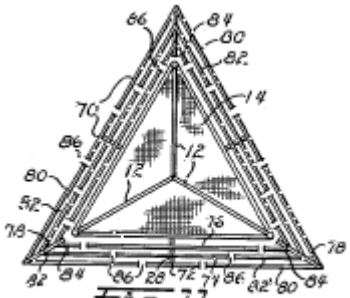


Fig. 11

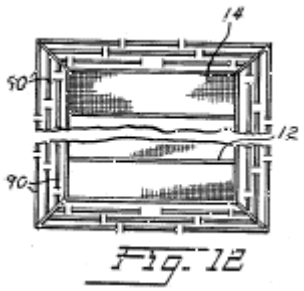


Fig. 12

FIGURES 13 and 14 are top plan and elevation views of a further embodiment of this invention;

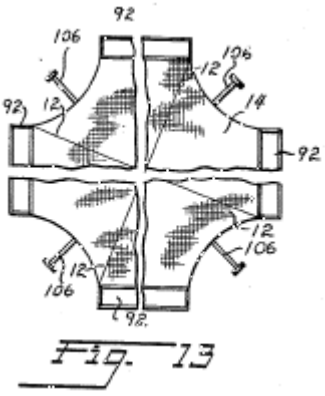


Fig. 13

Fig. 14

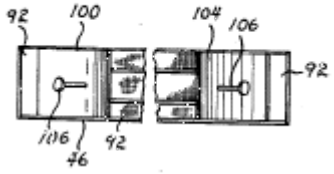


FIGURE 15 is a schematic diagram of a control circuit for causing the Ionocraft to lock-on and follow a radiation source at a ground station;

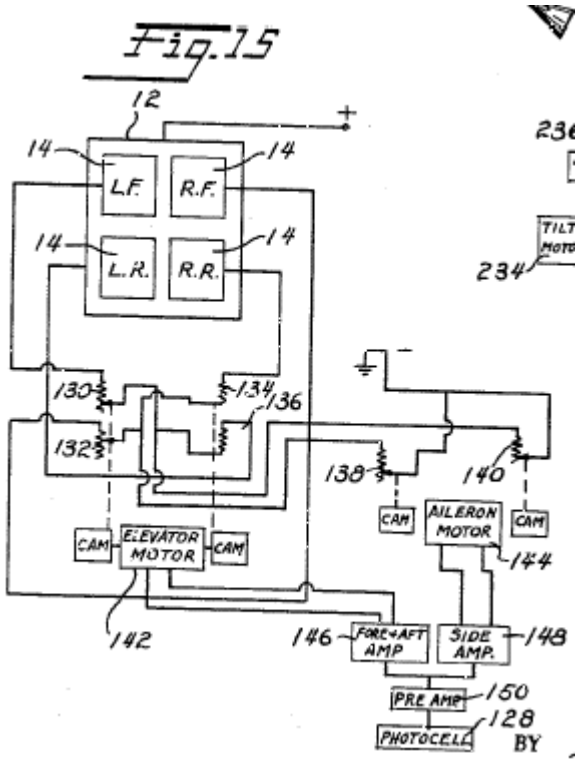
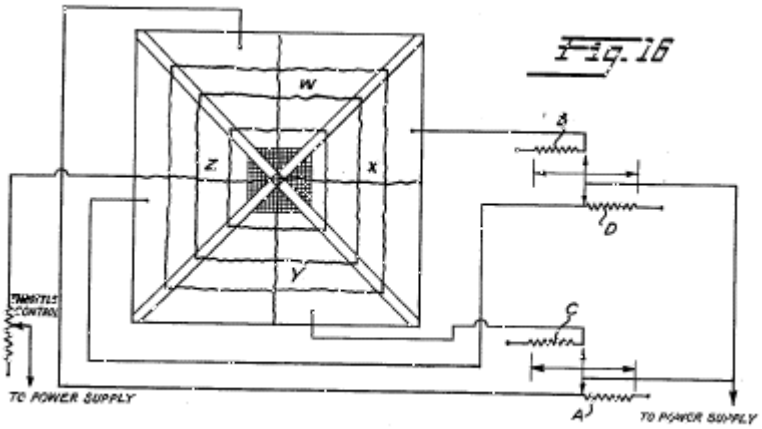


FIGURE 16 is a plan view, partly diagrammatic illustrating a control system for the craft of the present invention;



FIGURES 17 and 18 are side elevation views in section of a novel control stick box and assembly to permit steering and guiding of the craft by the system illustrated in FIGURE 16;

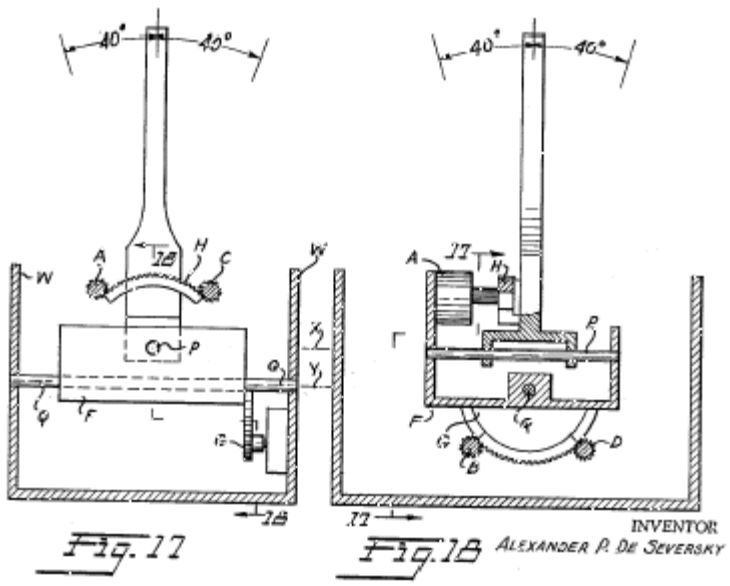


Fig. 17 Fig. 18

FIGURE 19 is a view in elevation of a craft having two vertical grid structure assemblies for controlling horizontal movement;

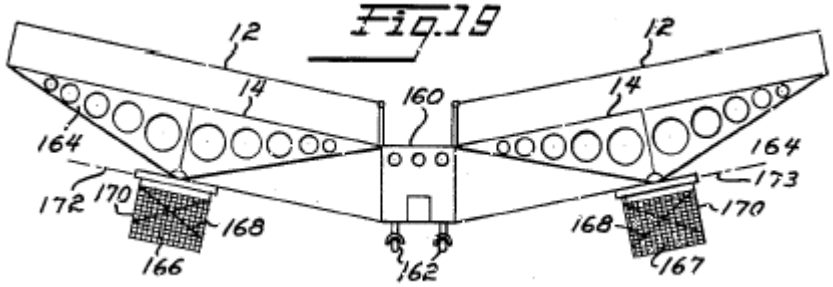
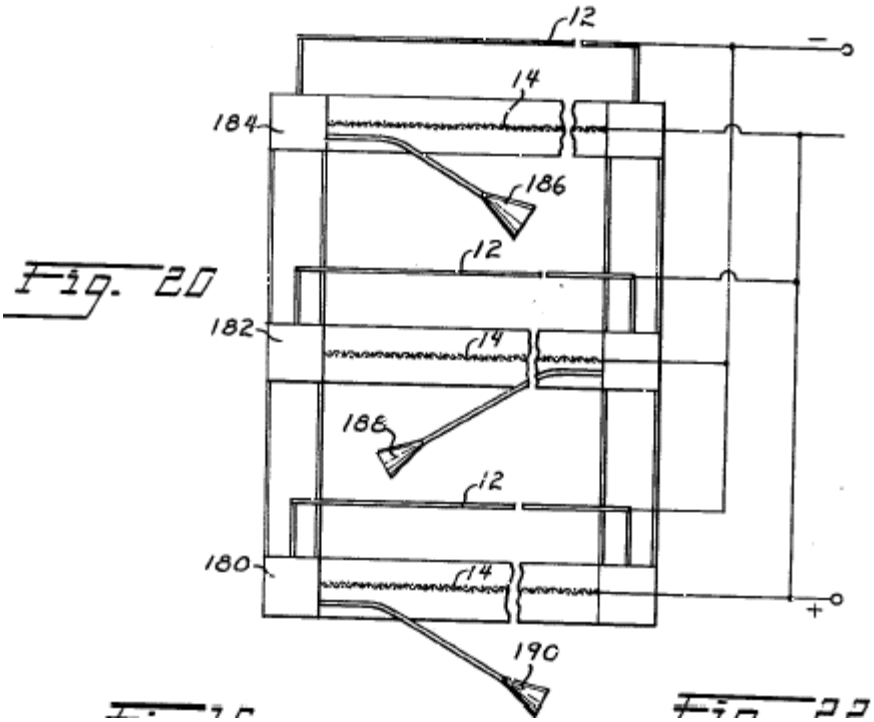


Fig. 19

FIGURES 20 and 21 are side views in elevation of different embodiments each having several horizontal grid structures stacked one on top of the other; and



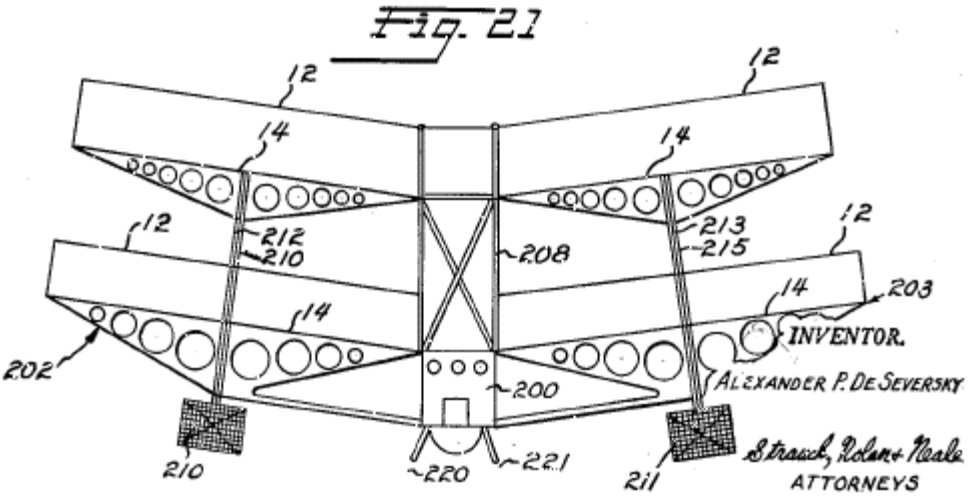
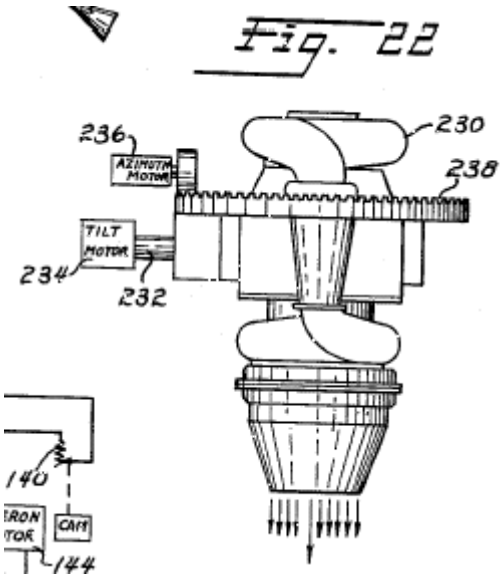


FIGURE 22 is a diagrammatic view of a gas turbine engine and mounting which are adapted for use with craft of the present invention.



Referring now to the drawings, FIGURES 1 and 2 are plan and elevation views of a typical basic embodiment of my improved Ionocraft 10. The Ionocraft proper comprises a plurality of emitting electrode wires 12 mounted above and in a plan substantially parallel to the collecting electrode grid 14 which may be composed of a meshed screen, bars, strips or any other structure that provides maximum effecting collecting electrode area with perforations, slots or other types of opening to allow the air to pass through with a minimum of drag. A plurality of hollow, lightweight rods or bars of conductive material or crossed wires forming a mesh which is open to pass air downwardly, but with the wires sufficiently closely spaced to effectively neutralise the charged ions which pass from emitting electrode wires 12 are preferred structures. A high D.C. voltage is applied between emitting electrode 12 and collecting electrode 14; one pole of terminal of the high voltage generator is connected to the emitting electrode 12 and the opposite pole or terminal of the same generator is connected to the collecting grid electrode 14, thus creating a high potential field between the electrodes.

In this form of improved Ionocraft, a basic structure sufficiently rigid to cope with the dynamic and static loads and to maintain a desired uniform distance between discharge emitting wires 12 and the collecting grid 14 is utilised comprising an outer square or rectangular frame composed of members 22, 24, 26, and 28. Diagonal frame members 30 and 32 extend between opposite corners of the rectangular frame and a circular frame member 34 is fixed tangentially to the midportions of the frame members. Sid frame members are coplanar and collecting electrode wires 14 are interwoven, as with a loom, to form a closely meshed wire screen and supported from frame members 22, 24, 26, and 28. The ends of each wire are wrapped over and glued to the lower half 26a of the frame member and then cut off as shown in FIGURE 2A. The upper half 26b of the frame member is then secured in position as the glue. A considerable improvement in lifting force was achieved when the frame members and cut ends of the grid wires were covered with an aluminum foil.

Four lightweight rigid structural members, 36 and 38, of which two show in FIGURE 2, are mounted beneath the plane of collecting grid 14 in the vertical planes to diagonal members 30 and 32. Members 36 and 38 meet in a common junction 40 at the center of the Ionocraft. Four perforate lightweight rigid metal sheets or foils 42 and 44 of aluminum or the like, of which only two show in FIGURE 2, are mounted between diagonal members 30, 32, 36 and 38. These foils

provide additional stabilisation against tilting by guiding the air flow vertically along the surfaces of the foils and have been found to provide and increase in lift which more than compensates for their weight. Beneath junction 40, a pair of crossed support members 45 and 46 are provided to serve as a landing support to hold the craft with the collecting grid 14 above the ground supporting surface 47 when landed.

The outer ends of emitting wires 12 are supported from masts 48, 49, 50 and 51 of insulating material mounted on opposite sides of the craft. In this embodiment, emitting electrode wires 12 pass diagonally across the craft and cross each other near the center. One terminal of a high voltage D.C. potential is connected to leads 52 which are connected to masts 48 and 49.

The lower edges of masts 48 and 50 and of masts 49 and 51 are connected together by tension member 53 (FIGURE 2) such as a lightweight cable to hold the masts in their vertical position by providing a force to balance against the tension force of emitting wires 12.

Suitable lead-in wires 54 are provided for connection between collecting grid 14 and the other terminal of the power supply, and are preferably at ground potential. Variable impedances, such as variable width spark gaps which serve to reduce the applied voltage, are provided in lead-in wires 54 for control of voltage between emitting wires 12 and collecting grid 14 to thereby control the vertical movement of the craft.

An actual embodiment built in accordance wit the foregoing descriptions which lifted itself into a self-sustaining flight had a collecting grid surface area of approximately 150 square inches and the space between the collecting grid and the emitting wires 12 was approximately 2 inches. With a craft having the foregoing dimensions, 0.5 milliampere was sufficient to make the craft more than self-sustaining. The total weight of the structure was approximately 5 grams. Other craft having the space between the collecting grid and emitting wires of 5 inches have been successfully flown. Such craft require voltages of the order of 50 to 60 kV. Where the grid area is about 7 or 8 square feel, currents of the order of 2 milliamperes exist. Variations in humidity and air pressure cause variations in the current drawn and in the lifting efficiency.

The lifting capability of the craft was found to increase as the diameter of the grid wires is increased. Crafts were tested with wire diameter of 2, 5, 8 and 12 mils for the collecting grid. With wire diameters of 8 mils or more, the current requirement to provide the same total lifting force shows a detectable decrease thereby indicating a higher efficiency. Hollow tubular conductors having an outer diameter of one-quarter inch also give substantially the same lift force and efficiency as the 8 and 12 mil wire diameters.

A modification of the foregoing structure is shown in FIGURE 3 wherein a central compartment section 60 is provided in the center of a surrounding large area collecting grid 14. A plurality of rigid support sections 62, each composing an upper member 64, a lower member 66, and an intermediate foil 68 extend from the corners of the central section 60 to the periphery of the framework surrounding the collecting grid 14.

Near each of the corners of the outer periphery of collecting grid 14 a mast 70 made of insulating material is provided which supports the outer end of emitting wires 12. A second group of inner support masts 72 mounted on central section 60 provide support for the inner ends of emitting wires 12.

In this embodiment, the central compartment 60 is adapted to house electronic equipment and the power plant and crew where used.

In practice, it has been found desirable to increase the lengths of emitting electrode wires by adding a series of wires 74 which are supported on the main emitting wires 12 and which are

parallel to each other and at a distance approximately equal to the distance of the emitting wires from the collecting electrode. The outermost wire is positioned inwardly about one-half the distance between the parallel wires (i.e., from 1 to 3 inches) from the outer frame members on the collecting grid to take full advantage of all the ionised particles which are produced. The radially directed emitting wires 12 are used to electrically connect the non-intersecting wires 74 together. However, the emitting wires 12 should be fewer and much less closely spaced than collecting grid wires 14 in order to avoid electrical symmetry. If the configuration of the emitting electrode wires 12 and the collecting electrode wires 14 are identical, no lifting force is provided.

A further embodiment is shown in FIGURE 4 which is identical with the form shown in FIGURE 3 except that the structure is equipped with positive dihedral for greater stability. Center section 60 is used as a center load carrying or cabin section and the rigid support sections are attached thereto so as to tilt upwardly to form a small angle a. Collecting grids 14 and their associated emitting electrodes 12 on opposite sides of center section 60 are thus angularly related.

This particular craft, because of its horizontal symmetry, is well adapted to be equipped with dihedral in the fore and aft direction as well as in the lateral direction. FIGURE 5 represents in an exaggerated schematic form and apparatus of this type. In FIGURE 5, the central section as shown in FIGURE 4 has been omitted and four collecting grids 14 are of a triangular shape with the inverted apex or nadir 69 of the system at the bottom and center of the apparatus. Separate emitting wires 12 are mounted from masts 71 supported centrally of the side edges and at the nadir. Each of the four collecting grids may be insulated from each other by a gap or insulating material and variable resistance incorporated in their lead-in connections (not shown) to the power supply. By independently varying the resistance of the collecting grids the craft, which is here assumed rigid, may be tilted in any direction.

FIGURES 6 and 7 are top plan and side elevations views respectively of a further embodiment which has a negative dihedral. In this embodiment, the collecting grid frame composes four outer peripheral lightweight wooden or metal members 600, 601, 602 and 603 which are mounted in a lower plane and four inner members 604, 605, 606 and 607 which are parallel to the respective outer members but in a plane higher then the plane containing the outer members. In an embodiment where the outer peripheral members were three feet long, the vertical distance between the planes carrying the inner and outer members was four inches. This negative dihedral has been found to provide greater stability during hovering flight than the positive dihedral though the positive dihedral appears to provide equally good stability for horizontal flight.

The collecting grid is divided into four equal areas by diagonally oriented frame assemblies 608, 609, 610 and 611. The collecting grid area visible in FIGURE 7 is bounded by rigid frame members 612 and 613 of diagonal frame assemblies 608 and 609 respectively and inner and outer frame members 604 and 600. The collecting grid, as pointed out above, may be a crossed grid of wires. The other three collecting grid areas are of identical size and construction.

Inside of inner frame members 604, 605, 606 and 607, no collecting grid screen is provided and the space may be left open or if desired, covered with a lightweight foil of insulating or conducting material. This air-tight foil forms a pocket under which a pressure appears to build up to provide added lift. The insulation material is preferred since this does not interfere with the electrical isolation between the four quadrants of the collecting grid which, as will be pointed out below, are used for guiding and/or propelling the craft.

Diagonal frame assembly 608 contains four cross braces 626, 628, 630 and 632 between frame members 612 and 613. The cross braces are made of an insulating material such as wood to

thereby insulate each of the four grid sections from one another. Frame members 612 and 613 intersect and are secured together above and inwardly behind member 604. Members 614 and 615 also intersect and are secured together, as do members 616 and 617 and members 618 and 619. These points of intersection are joined together by four struts 620 shown in FIGURE 6. Secured to the centers of each of struts 620 is a four-sided chimney 622, each of the sides being flat sheets of a lightweight insulating material such as wood.

A center frame member 624 is mounted between the center of cross brace 626 and the top of chimney 622 along each of the diagonal frame assemblies. This construction gives adequate rigidity to prevent warpage of the collecting grid frame assembly.

The emitting wires are illustrated diagrammatically as waving lines and make up a pattern of three parallel wires 640, 641 and 642 and one transverse wire 643 across each grid area. Four supporting masts 464, 647, 648 and 649 are mounted on cross braces 628 are secured to center frame member 624 in each of the four diagonal frame assemblies 608, 609, 610 and 611. Emitting wire 640 is supported on the upper end of each of masts 646, 647, 648 and 649 with sufficient tautness to be substantially equidistant from the collecting grid at all points.

Four supporting masts 650, 651, 652 and 653 are mounted to cross braces 630 and center frame members 624 in each of the four diagonal frame assemblies for supporting emitting wire 641. Four additional masts (not numbered) are mounted to cross braces 632 and center frame members 624 to similarly support emitting wire 642.

At the mid-points of each of the outer frame members 600, 601, 602 and 603, masts 656 are mounted to support the outer end of emitting wires 643, which extend under and in electrical contact with each of emitting wires 640, 641 and 642 to a center mast 660 which is suitably mounted to the top of chimney 622.

On electrical terminal 662 for the emitting wires is shown on the right side of the craft of FIGURES 6 and 7. Four individual electrical terminals 664, 665, 666 and 667 are provided for each of the four grid sections. If it is not desired to control the posture and movement of the craft by the four separate sections, collecting grid terminals 664, 665, 666 and 667 may all be connected together.

Also, it is obvious that the four electrically separate sections could be achieved by using four insulated emitting wire sections, either with the four separate collecting grid sections or with all the collecting grid sections connected together.

The foregoing craft weighted about 100 grams and with a 5 inch spacing between the emitting wires and collecting grid, was self-sustaining with a voltage of about 50 to 60 kV, and a current on the order of 2 milliamperes.

Instead of using a crossed wire mesh construction for the collecting grid as shown in detail in FIGURE 1, it has been found that tubes of conductive material having an outer diameter of about one-quarter inch are equally as good. Such tubes may be made of aluminum foil wrapped around paper or may be hollow lightweight aluminum tubing or of a similar construction. For example, material such as an air tight nylon base fabric having an evaporated metallic coating of for example aluminum may be fabricated in the form of tubes having a wall thickness of less then 1 mil and be adapted to be inflated with air or inert gas to form a hollow lightweight tubular member. The cross section may be circular, oval or the like; a tear drop shape as illustrated in FIGURE 8 is a preferred configuration since air flow across the tapering lower edge provides additional lift. For the craft configuration as shown in FIGURES 6 and 7, the inflated tubes of FIGURE 8 are mounted parallel to each other and to the outer and inner frame members 600 and

604, or to their corresponding members in each of the other collecting grid sections, with their ends secured to the diagonal frame assemblies 608, 609, 610 and 611.

Other emitting electrode constructions may also be used. For example, emitting wires 640-644 may have suspended from them a plurality of short wires 680 as shown in FIGURE 9 which provide a point of discharge rather than a line of discharge to thereby increase the efficiency of ionisation. In FIGURE 9, only emitting wire 640 and its supporting masts 646 and 647 from the embodiment shown in FIGURES 6 and 7 are illustrated. It is to be understood that all of the emitting wires may be of similar construction to that illustrated in FIGURE 9. Each of wires 680 is about 1 to 3 or more inches in length and separated at least one inch apart. The lower ends of wires 680 are kept at a uniform distance from the collecting grid. This construction may offer some pre-ionisation, though measurements show this emitting electrode construction to be about comparable to the use of plain wire as the emitting electrode.

FIGURE 10 illustrates an elevation view, and FIGURES 11 and 12 illustrate plan views of modified triangular and rectangular shaped Ionocrafts respectively. The craft of FIGURE 11 is triangular in config-uration and is provided with emitting wires 12 suitably supported from masts 48 as illustrated. In practice additional emitting wires may be used. Collecting grid 14 extends over a large area beneath emitting wires 12 and may be formed of crossed wires as diagrammatically illustrated.

The electromagnetic energy antenna carried by the foregoing Ionocraft embodiments may comprise a series of generally horizontal, parallel conducting elements or dipoles 70 arranged along the basic side structure on which the wires 12 and 14 of the craft are attached. Dipoles 70 may be of differing length so that the antenna provided may receive or transmit several different frequencies. For frequencies of the order of 10 megacycles, for example, several dipoles 71, 74 and 76 may be arranged as a tuned array, such as the yagi array, with one or more dipoles 71 serving as a director, dipole 74 serving as the main antenna element and dipole 76 serving as a reflector. Such antenna is highly directional and with an Ionocraft of triangular configuration, the antenna may be used with signal transmission in three separate directions simultaneously.

The antenna wires 70-76 may be small diameter rods of a conductive material such as aluminum, supported on lightweight rods or bars 78 of either a conducting or insulating material, as dictated by conventional antenna construction techniques. Additional antenna elements 80, 82 and 84 may be present as metal rods or wires separated electrically from the adjacent antenna elements by insulators 86 of a suitable light material such as wood, plastic or the like, indicated on the drawing by spaces.

The various antenna elements 70-84 and insulators 86 may comprise a rigid frame forming the basic structure for the craft and inside of which the collecting grid 14 is supported and upon which the discharge electrodes 11 are mounted. The antenna elements 70-84 may be stacked vertically if desired to improve both the efficiency of the antenna and the rigidity of the basic structure. To the extent that the antenna elements may be galvanically connected together without interfering with the operation of the antenna in its conventional manner, the antenna elements are preferably connected to the same DC potential as collecting grid 14. Thus, the antenna elements may also augment the operation of the Ionocraft by neutralising charged ions which provide the propelling force.

In the rectangular embodiment of FIGURE 12, the several antenna dipoles 90 have different lengths so as to be equal to one half the wave length X of the frequency being transmitted for an entire spectrum of frequencies having different wave lengths Xx, X2, X3... Xn. Since the length

of a side of the Ionocraft may be several hundred feet or greater, such construction is ideally suited for communi-cation systems, whether operating with high or low frequencies.

With either of the configurations of FIGURE 11 or FIGURE 12, the view in elevation will be substantially as illustrated in FIGURE 10 where the particular antenna structure is indicated schematically and designated by reference numeral 92. A ground station antenna which is indicated diagrammatically at 94 on FIGURE 10 may be provided for directing the signals downwardly to the ground station. Antenna 94 may be of any desired conventional type and connected on the Ionocraft to the main antenna structure 92 by a suitable transmission line such as coaxial cable, twin lead lines or hollow pipe wave-guide, depending upon the particular frequencies utilised. Amplifiers or frequency converters may also be provided in the transmission line where signal strength is weak. The amplifiers and/or frequency converters may be powered by well known self-contained batteries or by the power supply unit for the Ionocraft (not shown).

Referring now to FIGURES 13 and 14, a further embodiment of the invention is illustrated which has a plurality of side sections, four of which are shown curved. The contour of the curves may be parabolic or of any other shape as is conventionally used for antennas in high frequency systems such as radar or the like. In this embodiment, an outside frame of lightweight rigid 0.5 members 96, 98, 100 and 102 is provided to define the contour of the antenna shape. Lightweight wires or rods 104 extend between members 95 and 102 to serve as part of the antenna. Lightweight sheet metal of a material such as aluminum may be used in lieu of wires 104 for the 30 reflector surface if desired.

A plurality of horns 106 are illustrated in the drawings to effect simultaneous radar scanning through 360°. By oscillating the illustrated Ionocraft about its vertical center line through an angle of only 45° on each side of a center position, complete 360° scanning may be effected. Alternatively, the Ionocraft may be rotated continuously about its vertical center line and 360° scanning effected by one or more antennas. Such scanning may be effected by warped corners, reactive or propeller blasts of auxiliary power plant, or by auxiliary grids which are mounted for movement relative to the main lifting grid as will be described below. Scanning may be effected by other means as will become apparent from the following description. In lien of or supplemental to some of the microwave antennas 106, antenna reflectors for infrared detectors may be carried on the Ionocraft. Such antennas serve to collect the infrared energy over a large area and focus such energy on a small infrared detector, and they may be of any conventional construction. The basic structure 10 between spaced antennas may contain such equipment to transmit via wireless signal channels to the ground station through ground station antenna 94, signals corresponding to the electromagnetic and radio frequency signals received. Horizontal movement of the craft may be effected by the principles set forth in Serial No. 760,390 of Glenn E.Hagen filed September 11, 1958, by tilting the craft downwardly in the forward direction whereby the ionic propulsion force provides a horizontal force component to cause the craft to move in a horizontal direction. Tilting of the craft may easily be effected through variation of the voltage between emitting electrodes 12 and collecting grid electrode 14. For example, by electrically separating the craft into four sections of substantially equal size as illustrated in FIGURE 15, the voltage applied to two of the adjacent sections can be reduced by adding resistance in series with the current path and this will cause the lift produced by these two sections to decrease relative to the lift produced by the two other sections. Thus, horizontal movement of the craft may easily be controlled from the ground station. For manual control of the posture and flight movement of the craft of the present invention, it has been found desirable to provide a control stick assembly which functions similar to that familiar to persons flying

other types of aircraft. The control stick must function in both the longitudinal and lateral directions simultaneously and independently. Variable control elements such as potentiometers and variable transformers (powerstats for instance) may be used for control of the present invention. The posture of the craft may be controlled by dividing the collecting grid into three or more electrically separate regions as illustrated by the embodiment shown in FIGURES 6 and 7 and by individually varying the electrical potential to each of the separate regions. The potential may be increased to act as an elevator or may be decreased to act as a spoiler, and the voltage may be increased on one side while being simultaneously decreased on the other side to increase the effectiveness of the control.

Also, the emitting wires may be divided into three or more electrically separate regions and the electrical potential individually varied to each separate region. Again the potential may be increased or decreased, and may be simultaneously increased in one region and decreased in the opposite region.

To change the voltage to an individual region of the craft, a separate power supply for each region may be provided and the variable control element for changing the output voltage may be adjusted to produce the desired voltage level. Where a single power supply is provided, variable resistance may be placed in the electrical conductors leading to the appropriate terminals on the craft. If the craft is normally airborne with resistance present in the conductors, then increased voltage can be supplied to one region of the craft by decreasing the resistance in the conductor connected to that region. A decreased voltage can be supplied similarly by increasing the amount of resistance, and combination of increased and decreased voltages may be supplied to opposite sides of the craft to increase response of the craft to the controls.

One of the more simple ways to utilise the power supplied to the craft, I prefer not to have extra resistance in the power supply circuit of the emitting wires during normal flight and to control the posture of the craft by individually adding resistance into the circuit connected to each individual region of the collector grid. Such method of control has been found to provide adequate control of the Ionocraft and a control stick assembly will be described which utilises variable resistance elements which are conventionally known as potentiometers or rheostats.

In FIGURE 16 the collecting grid construction as shown in the preceding embodiments (see for example FIGURES 6 and 7) is illustrated with each of the four grid sections W, X, Y, and Z connected through a separate correspondingly designated potentiometer to one terminal of the power supply. The emitting wires shown diagrammatically as waving lines are connected through a throttle control potentiometer, which is used to control the maximum voltage applied between the emitting wires and all of the collecting grid sections. When this voltage exceeds a certain level but yet remains less than that which causes arcing, the craft will rise. The effect of potentiometers A, B, C and D is to controllably reduce the voltage between the emitting wires and any one or two specific grid sections to thereby reduce or subtract from the effectiveness of that portion of the craft in producing its lifting force. This then causes the craft to tilt downwardly in the direction of whichever of the grid sections has the reduced voltage.

Referring now to FIGURES 17 and 18 front and side elevations of the control stick are shown with the respective shafts of the four potentiometers labelled A, B, C and D. On each of these shafts spur gears (not shown) are provided to be driven by gear segments secured to the stick.

The control stick is mounted for pivotal movement about pin P having axis X and about pin Q having axis Y beneath, but in the same vertical plane as axis X. Pin Q is mounted with its ends in opposite side walls W of the control stick housing.

The entire stick assembly shown in FIGURES 17 and 18 is mounted for unitary movement in a plane perpen-dicular to the longitudinal axis Y of pin Q. This as-sembly comprises bracket F which has secured to one side face spur gear G which need have only a segment thereof with teeth to mate with the pinion gears on the shafts of potentiometers B and D. The housings for potentiometers B and D are mounted on housing walls W, and the center of the gear segment on gear G coincides with axis Y of pin Q.

The ends of pin P are mounted in opposite sides of bracket B to enable the control stick to rock in a plane perpendicular to the longitudinal axis X of pin P. The lower end of the control stick is bifurcated as shown in FIGURE 18 and adapted to pivot about pin P. Gear segment H, having its center at axis X of pin P, is secured to the control stick for driving pinions on the shafts of potentiometers A and C which are mounted on bracket F.

The foregoing construction permits the control stick to function both in a longitudinal direction and in the lateral direction simultaneously to function as an electrostatic spoiler in the sense that when the craft is airborne, the addition of resistance in the lead-in wire to a particular grid section spoils the lift of that section to thereby control the posture of the craft in flight.

In the described embodiment, stick movement was limited to about 40° by mechanical stops not shown. The pitch diameter of each gear segment G and H was about 6 inches and the pitch diameter of the pinion gears on the potentiometer shafts was about 1 inch. The potentiometer gear shafts were capable of rotating through 240°, and were spring biased to a zero resistance con-dition.

As is apparent from FIGURES 17 and 18, the position of the pinion gears for the four potentiometers A, B, C and D is at the exact ends of the corresponding gear segments so that when the control stick is in its illustrated vertical position, each potentiometer is rendered ineffective to add any resistance to any of the collecting grid sections. As the control stick is tilted, one of the potentiometer shafts is rotated and there is absolutely no possibility that the potentiometer to the opposite grid section can be made effective at the same time because the partial gear segment and the spring loaded potentiometer shafts are used. The length of each gear segment must be at least as large as the maximum angle through which the stick can be moved, and the pinion gears are preferably at the precise ends of the gear segments.

It was found that if the potentiometer shafts were not spring loaded, the gears would upon occasion rotate slightly so the teeth did not always mesh when the stick was moved in a direction so that the gear segment should have engaged the potentiometer pinion. By the manual control stick just described, adequate tilt of the craft is readily achieved. The position of the craft in air may be remotely controlled from a ground station through wireless control systems which may be of any suitable known type. The horizontal position of the craft may also be controlled automatically. For example, the position of the craft of the present invention may be automatically controlled in space through means of suitable centering or tracking appara-tus operating on well known principles, such for example as are disclosed in U.S. Patent Nos. 2,513,367 to Scott, or 2,604,601 to Menzel. In such tracking apparatus, one form of which is diagrammatically illustrated in FIGURE 15, a beam of electromagnetic energy, such as light or infrared, is centered on a suitable photocell 128 which generates control signals that are used to control variable impedances to reduce the voltage applied to various sections of the craft to thereby control the position of the craft in accordance with the position of the beam source at the ground station.

FIGURE 15 illustrates in detail suitable horizontal 7a positioning control arrangement. The common grid electrode 14 is connected to the negative terminal of the power supply and the

emitting wires 12 are electrically separated into four sections, viz. left front LF, left rear LR, right front RF and right rear RR. Each of these sections is connected through variable impedances 130, 132, 134 and 136 respectively of the elevator control unit and the variable impedances 138 and 140 of the aileron control unit to the positive terminal of the power supply. The elevator motor 142 drives the movable con-tacts on variable impedances 130, 132, 134 and 136 and the aileron motor 144 controls in a similar manner values of the impedances 138 and 140. Each motor 142 and 144 may be driven by separate amplifiers 146 and 148 and pre-amp 150 in a manner as conventionally used in servo systems to position photocell unit 128 directly in alignment with a source of electromagnetic energy positioned on the ground.

Referring now to FIGURE 19, a craft having a central cabin 160 and equipped with dihedral is illustrated. The collecting grid 14 and emitting wire 12 construction may be similar to that described in connection with FIGURE 4 and be positioned on alternate sides of cabin 160. Beneath cabin 160, a suitable wheeled, skid or pontoon landing gear 162 may be provided.

Depending beneath frame members 164 and on opposite sides of cabin 160 are a pair of auxiliary grid as-semblies 166 and 167 that are mounted to be operable in a generally vertical plane. Each auxiliary grid assembly 166 and 167 is provided with laterally spaced emitting wires 168 and a collecting grid within outer frame members 170 so that upon receipt of a suitable D.C. potential, a horizontal thrust is provided in the manner here in before set forth.

Each auxiliary grid assembly 166 and 167 is mounted on frame members 164 for independent rotational move-ment about substantially horizontal axes 172 and 173. With the emitting wires 168 of both auxiliary grid assemblies facing in the same direction, the craft will proceed in the direction toward the emitting wires. With the emitting wires 168 of auxiliary grid assembly 167 facing in a rearward direction and emitting wires of grid assembly 166 facing in a forward direction as illustrated in FIGURE 19, the craft will revolve about an axis midway between the effective centers of the two grid assemblies. If the craft is simultaneously tilted in a cyclical manner, an effective radar antenna searching motion is provided which may include a large vertical angle as well as a 360° horizontal scanning operation.

Except where rotation of the craft for searching or scanning operations is a principal purpose for the craft, the emitting wires 168 of each auxiliary grid assembly 166 and 167 are mounted to face in the same direction. When landing or taking off, which is always accomplished in a vertical direction, auxiliary grid assemblies 166 and 167 are preferably pivoted into a horizontal plane. This not only retracts them to prevent interference with landing operations, but also provides a multiple deck structure to give additional lift and control of stability. Horizontal speed may be controlled by varying the angle of auxiliary grid assemblies 166 and 167 with the vertical.

As shown in FIGURE 20, the Ionocraft may comprise several decks 180, 182 and 184 each of which is of similar construction to the single-decked craft shown in FIGURES 10-14. Each of the basic structures 180, 18l and 184 may comprise different antenna types if desired. Several separate ground station antennas 186, 188 and 190 may be provided particularly where independent signals are transmitted and received by the several antennas of the Ionocraft.

In FIGURE 21, a multiple decked craft is illustrated which comprises a central cabin 20P, from which two lifting grid assemblies 292 and 203 extend laterally on opposite sides which are equipped with dihedral. Above grid assemblies 201 and 203, one or more pairs of similar grid assemblies 204 and 205 are supported by a suitable superstructure 108. The turning axes 212 and 213 for auxiliary grid assemblies 210 and 211 in this embodiment are substantially vertical and extend through support members 214 and 215 to the upper grid assemblies 204 and 105 to

provide added rigidity to the craft structure. Retractable antennas 220 and 221 may be provided beneath cabin 200 for establishing communication channels to the ground station (not shown).

In general, it makes little difference whether the emitting wires 12 are connected to the negative or to the positive terminal of the power supply. By tests, it has been determined that with emitting wires 12 connected to the negative terminal, there is an improvement of about 5% over that obtained when the emitting wires 12 are connected to a positive terminal.

In the multiple deck constructions, it is preferable to connect emitting wires 12 and collector grid wires 14 of the adjacent decks to opposite terminals of the high voltage generator as illustrated in FIGURE 20, thus making discharge or emitting wires 12 in alternate decks positive and the collector grids negative which is the reverse of the .polarity shown in FIGURE 1. In that case, tilting is effected by varying either the negative or positive potential of the corresponding emitting electrode wires and grid sections to provide a rolling movement longitudinally and laterally.

All the above mechanisms and procedures provided for manual control can be utilised for automatic control actuated by an automatic pilot director through suitable servo-mechanisms.

The tilting of the craft in the case of embodiments like those diagrammatically indicated in FIGURE 15 and 16 provides forward gliding movements much in the manner that a helicopter is propelled in a horizontal direction. Where other means are used for horizontal propulsion, such for example the auxiliary grids shown in FIGURES 19 and 21 or in conjunction with propellers or jet stream, then the tilting will be used to maintain a desirable posture in space. All these move-ments may be controlled automatically by conventional stabilising and steering mechanisms borne by the craft or such movement may be accomplished from remote transmitting points either on the ground or from another airborne craft.

The maximum size of crafts of the type here involved is theoretically unlimited, except for structural considera-tions, since the mount of lift provided increases continuously with area. It is thus contemplated that a particularly useful function of the craft of the present invention may be to serve as means for destruction through collision oncoming vehicles and missiles through air and space. Intercontinental as well as space missiles enter the atmosphere over a target area in predictable trajectories, the terminal end of which is a substantially vertical path. Thus, the large horizontal area of the craft of the present invention is particularly suitable for the purpose of protecting sensitive target areas such as large cities, naval task forces, troop concentrations and the like by its mere physical presence during hovering operations. By manoeuvring the craft laterally it is possible to protect an area much larger than the area of the craft since present detection systems give identifying information of the target area about 15 minutes prior to arrival of the missile and the lateral movement of the craft may be effected at speeds of the order of 60 miles per hour, or more depending upon the horizontal propulsion system used. If the target area is vast, several Ionocraft could be maintained aloft to assure collision with oncoming missiles.

While the craft may be powered through conductors 70 extending from ground or ship towers or via microwave power transmissions, it is contemplated that lightweight power plants such as gas turbines or the like, be used to drive suitable high voltage generators which are aboard the craft. As shown in FIGURE 22, turbine 230 may be so mounted that its exhaust is directed vertically downwardly to provide additional lifting force while providing shaft rotation for producing the electrical power for the Ionocraft. Turbine 230 is here shown to be mounted for pivotal movement about the axis of shaft 232 which is driven by a tilt motor 134 to change the direction of the exhaust gases from vertical toward a horizontal direction. The entire tilt motor 234, shaft 232 and turbine 230 assembly may be mounted to be rotated in azimuth by azimuth motor 236

driving annular ring gear 238. Thus, in emergency operations where maximum horizontal speeds are desired, motors 234 and 236 may be controlled to advance the craft at higher velocities.

Other types of convention airborne power plants, such as :turbine propeller combinations, may also be utilised for providing additional lift and aiding in maneuvring in the atmosphere. The turbine of FIGURE 15 may be provided with a reverse thrust device or such propellers may have a reversible pitch, and steering may be accomplished by rudders or vanes located in the jet stream of the turbine. Also, high voltage generation by radioactive isotopes is another method of obtaining the necessary high voltage energy or a primary source of ionisation for the propulsion and sustenance of the Ionocraft.

It is also contemplated that this craft may be supplied with electrical power transmitted to the Ionocraft while in flight by microwaves. It has .been demonstrated 80% of the energy emitted from a ground station microwave antenna array can be collected in the form of heat by airborne vehicles. In this case, such heat may be readily converted into high voltage by conventional means such as turbines operating high voltage generators, suitable thermocouples and vibrator-transformer converters or the like. The use of high power microwave amplifiers, such as Amplitrons (Raytheon Co.), for power transmission via microwaves can provide the requisite power for a craft of this type. Therefore, it may be not essential that a self contained power unit be carried by the craft for special uses.

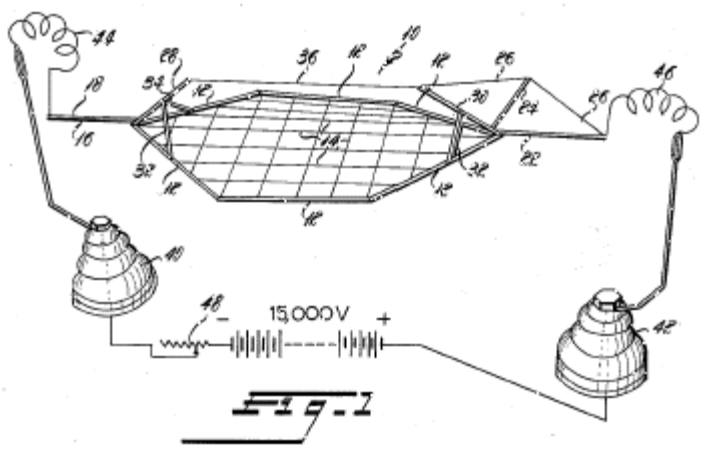
In the preferred form of the craft adapted for military purposes, directional detecting apparatus such as radar or infrared equipment will be carried by the craft to enable an antenna on the craft to lock-on any target object in air and space for the purpose of guiding the craft into the path of such oncoming target object. An Ionocraft of sufficient lift capacity may carry its own computers to process the electromagnetic information to provide the necessary impulses to the controls of the propulsive means to place the craft in the path of collision. Such craft may also be guided from the surface of the earth or from an airborne vehicle in flight, by remote control means to accomplish the collision with an oncoming object.

Explosives may be carried by the Ionocraft for destroying such oncoming objects if the mass of the Ionocraft is inadequate for destructive purposes. Such explosives may be of any known type and adapted to be detonated either upon impact or by proximity fuses where desired. Other types of countermeasures or defensive devices for causing premature explosions of the warhead of a missile may be carried by the Ionocraft as occasions arise.

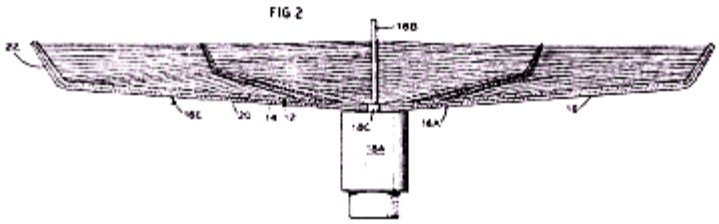
The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Related US Patents ---

US Patent # 3,120,363
Flying Apparatus
G.E. Hagen



US Patent # 3,464,207
Quasi-Corona Aerodynamic Vehicle
Ernest C.Okress



Gianni A. DOTTO Diamagnetic Levitation Thermionic Couple ("The Dotto Ring")

The Dotto Ring was a successful treatment for cancer, yet it disappeared from public notice in the 1970s after the FDA suppressed the technology. In one account of the story, it has been claimed that the device also tended to LEVITATE, and this was the real reason the government suppressed the discovery. Dotto states (Section 2 below) that the combined Thompson-Peltier-Seebeck effect is akin to gravity.

The Story of the Dotto Ring

Background of the Theory of the Dotto Ring

US Patent # 3,839,771: Method for Constructing a Thermionic Couple

US Patent # 3,785,383: Electrostatic Wand (Abstract & Figure 1, 2)

The Story of the Dotto Ring

[An unidentified article published in the 1970s; author unknown]

Gianni A. Dotto was born in Venice, son of a prominent engineer who was the designer of two hydro-electric generating plants on both the American and Canadian sides of Niagara Falls. His father was an Italian Marquis and since Gianni is the eldest son, he would have inherited the title had he not become an American citizen. The family is directly descended form Galileo and the Galileo coat of arms has been adopted for use as the Foundation's letterhead.

Before World War II, Gianni had received flight training but Mussolini never did trust the Dotto family so Gianni was drafted into the Italian Army as a paratrooper. When Italy surrendered, Gianni was able to join the American Air Force as a fighter pilot in time to participate in numerous engagements against the German Messerschmidts before the war ended.

After the war, Gianni became the head of the racing division of Alfa-Romero and started race-driving cars of his own design. His racing career ended when his wife, Renata, handed him an ultimatum: "Either give up racing or me". He is a prolific inventor as he is the owner of many Italian patents bearing on the automotive industry and, subsequently, just as many American patents.

He is highly educated, holding the Italian equivalent of an American PhD in nuclear physics from Milan University and the same degree in mechanical engineering from another Italian technical school. Subsequently, he received a degree in electrical engineering from Wayne University of Detroit.

While Gianni was teaching at Milan University, the medical school requested the services of a physicist to collaborate with the doctors on a research project. This started him on a career as a "bio-physicist" --- that is, a physicist that specializes in the area of the science of physics that bears on the human body. This embraces an amazingly wide field, as it has to do with the magnetic fields, polarity, the various vibrations and pulsations generated by the brain and, of course, the effect of the many facets of nuclear fission on the human body.

It was there that Gianni discovered that magnetic fields induced by an electric coil and by permanent magnets had a small effect on the human body, but that a mild magnetic filed created by adjacent hot and cold areas was definitely beneficial. In other words, the thermal unbalance created a magnetic field that matched the natural field of the human body. The development of the "Dotto Ring" was Gianni's practicable way of producing a piece of equipment that could impress the beneficial magnetic field on the body. The ring is 27 inches in diameter, made of heavy copper and has an adjacent heated and refrigerated area.

Through the ring he has reproduced in a compact, accessible form the same magnetic environment responsible for the good health and longevity of the Hunza people. Visitors to Hunzaland always attribute this great advantage to their diet, air and water, but Gianni could not accept this belief because there are many valleys in the Himalaya Mountains where the diet, air and water are similar to that of the Hunzas' but the inhabitants of these valleys are devoid of the same health and longevity manifestations as in Hunza. With the principle of the Dotto Ring in mind, a panoramic view of the Hunza valley makes Gianni's theory easy to understand. At the head of the valley there is a huge glacier or ice mass and in the valley itself the temperature becomes quite warm, thus creating the thermal unbalance mentioned previously and which is recreated in the principle of the Dotto Ring. When a Hunza travels across his valley, he receives

a beneficial treatment from a mild magnetic field. The similarity of the Dotto Ring to the Hunza valley is interesting to say the least.

Gianni has written what he describes as a "simple explanation of just how the ring works". Simple to a physicist perhaps, but difficult for a layman to understand; consequently, the following preliminary explanation has been outlined for the purpose of clarification:

The nucleus of each cell contains a material known as the DNA, which is an abbreviation for deoxyribonucleic acid. This substance contains the life or genetic code. The presence and function of the DNA has long been suspected by our doctor-scientists and had been presented as a theory, but it was only about 7 years ago with the development of the electron microscope that the presence of the DNA was confirmed. Now it can be seen, photographed and sketched. Imagine a tiny ladder twisted together in a coil fashion until the unit forms a double helix. The DNA is pliable and rubbery an is never still as it constantly vibrates in resonance with brain signals and even outside influences. The DNA is polarized, with one end being plus and the other being minus. A healthy DNS reproduces healthy cells and aids the body to naturally overcome and eliminate an invasion of bacteria or toxins. This, of course, adds up to good health. When the body is within the beneficial magnetic field of the Dotto Ring, polarization of the DNA is oriented properly and resonance is synchronized to that of a healthy cell.

Important animal tests required by the medial authorities have been underway for the past three years, culminating in seven official tests that were conducted under rigidly controlled conditions. The tests were conducted by Prof. Gerald Willis (Biology Professor at the University of Dayton) and Dr. Robert Zipf, PhD. Dr. Zipf is owner of a group of biological laboratories and has been Coroner of Montgomery Country (OH) for 20 years. The room in which the tests were conducted was kept under triple lock so that only Prof. Willis had access to the area. Dr. Zipf performed the pathology on the test mice.

Mice (6 per cage and 8 per cage per test) were injected with cancer cells, In three tests, C-27 cancer cells were used and in two other tests, Krib type carcinoma cells were used. The most recent tests were conducted in mice that had induced leukemia.

Results have been very good indeed. The untreated mice died in about 7 days while with few exception the treated mice survived. When the treated mice were finally sacrificed, they showed no evidence of cancer. These tests, as well as actual experience using the ring on the human body, prove definitely that there are no side effects.

Gianni Dotto has now had 5 years of experience in the use of his ring. For the past 2 years the ring has been in operation in his Bio-Physics Laboratory (Kettering, OH). Results have been uniformly good.

Following is the scientific paper prepared by Gianni Dotto.

Background of the Theory of the Dotto Ring

Most of the external physical factors which have been implicated in the evolution of life are of an electromagnetic nature. It has now been established that throughout the reviewable geological period the biosphere has been a region of electromagnetic fields and radiations of all the frequencies known to us --- from slow periodic variations to the earth's magnetic field and electric fields to gamma rays.

It is fundamentally possible on the basis of general considerations that any of the ranges of the electromagnetic spectrum could have played some role in the evolution of life and are involved

in the vital processes of organisms. This has already been demonstrated for a considerable region of the spectrum; for electromagnetic radiations in the infrared to ultraviolet range (photobiology) and from x-rays (radiobiology).

The situation is different with the vast remaining region of the spectrum, which includes electromagnetic fields (EMFs) of super-high, ultra-high, high, low, and infra-low frequencies. Experimental investigations and theoretical considerations suggest that EMFs can have a significant biological action only when their intensity is fairly high and that such action can be due to only one process: conversion of electromagnetic energy to heat or vice versa.

There is an increasing amount of reliable experimental data which indicates that EMFs can have non-thermal effects and that living organisms of diverse species, from unicellular organisms to man, are extremely sensitive to EMFs.

Finally, it has been found that very weak natural EMFs can have non-thermal effects and that living organisms of diverse species, from unicellular organisms to man, are extremely sensitive to EMFs.

Finally, it has been found that very weak natural EMFs can affect organisms of various species. All this indicates the necessity for a fundamentally new approach to the problem of the biological action of EMFs and for the need to reconsider the question of the possible role of EMFs in the vital activity of organisms (Parin).

It is believed that my work is not the first attempt at such an approach to the problem on the basis of the concept of the informational role of EMFs in the evolution and vital activity of organisms. There are three kinds of "biological activity of EMFs":

(1) The effect of natural environment EMFs on the regulation of vital processes.

(2) The role of internal fields in the organism in the coordination of physiological processes.

(3) The interaction between organisms by means of EMFs.

It is not sufficient to consider only the energetic aspect of the interaction of EMFs with biological systems and a portion of my past investigations have dealt with the informational functions of these fields in living nature.

I have constructed equipment necessary to conduct my cancer research. A substantial data bank of case histories has been accumulated. Not all case histories are well defined, but general results are amazingly good. This is understandable, however, since I am in the process of establishing the first formulation of a new biological problem.

My concept of the information functions of EMFs in living organisms and the hypothesis expresses in this respect will undoubtedly rouse interest in a wide circle of the medical readers.

The objectives of this research project are:

(1) Prove that the human body responds favorably when exposed to EMFs.

(2) Establish what types of EMFs are more effective.

(3) Determine the specific frequency of EMFs for different types of disease.

Working Theory of the Dotto Ring

There are four basic, major but disparate theories explaining the development of cancerous tissue.

(1) Virus (theory supported by scientists of Sloan-Kettering, NY).

(2) Low negative voltage across cancer cell skin (Cone, NASA).

(3) Excess of base pairs per turn on DNA double helix (Dotto).

(4) Alteration of the DNA code due to a certain type of virus (Temin).

The first theory would be correct if we are to accept the hypothesis that all the viruses of the four groups responsible for the manufacture of the nuclei (even if similar in size, shape, and crystal form) are tuned to a different frequency, according to the location in the human body of different groups of cells. In this case, a virus out of position can create the Temin phenomena of mixing up the sequence of the DNA code. If this is the case, the theory that someday immunization against cancer will be as simple as polio immunization is unrealistic. The variety of cancer immunization viruses will be in the numerical magnitude of trillions.

Theory #2 (Cone, NASA) would be acceptable if we consider a cancerous cell a parasite cell, to some extent.

According to Theory #3 (Dotto), the magnetic charge of the genetic code is maintained at the proper level by the electrical property of the double helix, which functions as a common transformer; where voltage of the primary and the secondary winding is proportional to the number of turns of the coils.

If the DNA double helix of a cancer cell has a lesser number of turns than the DNA double helix of a normal cell, then the voltage across the cancer cell must be lower than the voltage across the normal cell; consequently, the number of base pairs per turn will be greater. Greater base pairs per turn of the double helix and eagerness of completing the outer electron orbiting of the atomic structure of the nucleus leads to a greater capacity of reproduction of the DNA.

The second and third theories then are similar in principle but explained from a different observer's viewpoint. One explains the result; the other explains the cause.

Theory #4 (Temin) is a consequence of Theory #1 (Sloan-Kettering, NY) --- however, with an incorrect interpretation of the phenomena. Due to the tremendous variety of viruses classified in 8 distinct groups, 4 RNA types and 4 DNA types, there is no way in which to resolve the immunization capability unless the immunization factor can be obtained with the natural method described in the second Dotto patent application # 42,301, filed June 1, 1970:

"Milk taken from the right breast of a nursing mother is maintained separate from the milk taken from the left breast. On high-G centrifuge, viruses are separated from proteins and fats. Immunization will start with oral or injection methods, by using RNA type viruses from the right breast and repeated tow months later with DNA type viruses from the left breast. In the human breast, there are all the variety of viruses necessary for the immunization."

Why, then, the electronic reactor (Dotto Ring Device) and not chemistry to resolve the problem?

To begin with: in the normal process of life of a healthy body, when a new cell is produced, the orbital electron spinning of the new cell assumes a direction opposite to one of the mother cell, in order to maintain the mutual attraction. When the increasing kinetic electron energy of the new cells overcome the energy of the mother cell, the orbital electron spinning of the mother cell is forced to change direction and mutual rejection occurs. In the process, the entire energy of the mother cell collapses (in the same fashion as a transformer core) and its energy is absorbed entirely by the new cells.

However, if the energy potential and derived magnetic field in the human body is diminished or unbalanced, the new cell loses the body support to increasing kinetic energy and the dying cell never changes direction electron spinning. The dying cell then maintains enough residual energy

to be attracted by the new born cell and becomes its parasite. The DNA of the new cell now must perform double work; support the new cell and the parasite cell, with the result that the life span of the new DNA will be shortened. The oncoming new DNA must now have enough energy to support the dying cell and the parasite cell. Furthermore, it cannot rely any longer on the body support due to a weak or unbalanced magnetic field. In a desperate attempt to be liberated of the parasite cell, the DNA sends a message to the enzymes. Most of the time the enzymes are too busy in the assimilation of the processed food of modern civilization with the result that the DNA of the new cell has to support two parasite cells, and so on…

When the combined energy of the parasite cells becomes greater than the energy of the new cell, the new DNA loses control over the RNA in the formation of protein. The RNAs are then formed by the combined genetic code of the DNA of the parasite cells. This will occur when enough or greater genetic code in the summation of parasite cells overcomes the control of the normal DNA. The DNA code so completed may have all the information necessary to sustain life, but in the wrong sequential order; and a new strange life in the life is born. This phenomenon is known as cancer. From the above explanation it is quite obvious that a cell in the dying process must lose its entire energy to be removed by the blood or lymphatic system; otherwise the body must have enough enzyme supply to destroy the cells before they become parasites.

To prevent and control cancer, several methods can be applied:

(1) Magnetic intensity, homogeneity, and orientation in the human body must always be maintained at the optimum level.

(2) Mineral balance and proper distribution are essential.

That is, the cell needs copper to convert AC impulse from the nervous system to DC energy. This energy is necessary to maintain the DNA in the proper oscillatory frequency.

Aluminum and zinc are necessary to maintain the voltage level.

Iron is necessary to accumulate inductive energy EMF.

The most important elements, magnesium and oxygen, are necessary to insure the total collapsing effect of the iron when the electron orbital spinning in the nucleus reverses.

In modern civilization, where the entire environmental surrounding is bound to destroy humanity, the above conditions are essential for survival. While natural food consumption maintains the proper mineral balance, and may maintain the enzyme proportion in the high level, the most important factor is to supply the body with enough energy to maintain the magnetic field as described above. However, we must clarify that we call the magnetic force any energy capable of attracting or repelling matter. In reality, there are four different types of magnetic force, each one caused by a different physical phenomenon.

(1) *Permanent Magnet* ~ If we try to magnetize a copper bar, we will never succeed because in the copper the outer orbit of the electrons increases the kinetic energy without shifting electrons from one orbit to another. We will obtain the same effect if we try to magnetize a bar of nickel.

Now let's take a copper-nickel alloy, such as alnickel, and expose it to the EMF of a high inductive coil. The directional spinning of the electrons' orbit in the nickel does not change, but the orbital spinning of the electrons in the copper reverses its direction. Result: any atom of nickel strongly attracts an atom of copper, creating a bipole. The energy summation of all bipoles combined creates one of the strongest permanent magnets on the market --- alnickel V. Every permanent magnet then must be composed of at least two different atoms, one of which is

willing to change the orbital spinning direction of the electrons. This type of permanent magnet is not recommended for any therapeutic purpose for the human body.

While in mice tests this type of permanent magnet seems to be very promising (Barnothy, Pressman, etc.), the physical working principle is similar to the H bonds' attraction that holds together the DNA. The tumor in the mouse disappears due to the disassembly of the DNA in the affected cell by the demagnetization effect of the H bonds. At the same time the genetic code of the healthy cell is also altered and the consequences in the following generations could be very undesirable.

(2) *Electromagnet* ~ This type of magnetic field obeys the third Newtonian law of motion (to every action there is always an equal and opposite reaction).

If an iron bar is inserted in the center of an inductive coil, every electron traveling along the coil wire forces one electron in the iron bar to travel in the opposite direction. This type of magnetic field is not recommended for any therapeutic purposes. On the contrary, it has been proved to be detrimental even in mice tests. Electrons flowing along the magnetic coil will shift electrons from one part of the body to another. In this process RNA type viruses of negative polarity will be shifted from diseased cells to healthy cells in the same fashion as electrons. Furthermore, the shifting of electrons deprives the healthy cells of the energy necessary to support life and will produce severe side effects of dizziness that will last for several days thereafter.

(3) *Electrostatic Attraction* ~ When we rub a bar of hard rubber or a bar of amber, one acquires electrons in excess and the other loses electron from the outer shell orbit. Consequently, one will attract particles rich in electrons and the other will attract particles poor of electrons. This type of magnetic attraction is not recommended because one will weaken the energy of the normal cells; the other will increase the negative potential of the skin of the cancer cell, thus facilitating the growth of the cancer.

(4) *Thermomagnetic Field* ~ The thermomagnetic field is the product of the Thompson-Peltier effects combined, known in physics as the Seebeck Effect.

The thermomagnetic field is responsible for the general gravitation system: heat (sun) attracts cool (planet) and vice versa. According to Dotto law:

$F = G\ M'M''/$[sq root of] $1-(K'/Pamu/K''/Eamu\ 4/3\ pi)^2 / R^2 /$ [sq. root of]$1-(K''/K1)^2$

K' = warmest body; K" = coolest body; Pamu = 1.00759; Eamu = 0.00055; $G = 6.66 \times 10^{-8}\ cm^3\ g^{-1}\ sec^{-2}$

The Newtonian law of attraction $F = G\ (M'M''/R^2)$ can be applied only between two masses having the same temperature.

This type of magnetic field is the only type of energy proven to be beneficial to animals and humans. Since humans have lived in this constant magnetic or gravitational field for millions of years, the body has become very sensitive to any variation.

The Thompson Effect

One end of a copper rod is heated and the other is cooled. If the hot side is heated high enough, it will thermally increase the kinetic energy of the outer orbit electrons to a point where their kinetic energy ($1/2\ mv^2$) will be greater than the work function and allow them to discharge into space. Due to the copper conductivity the electrons, instead of dissipating into the air, will shift in tremendous quantity toward the cools side in straight lines, following the heat propagation velocity. By reaction, excited electrons for the cool side will travel in the opposite direction at the speed of a particle ($1/2\ mv^2$) toward the hot side encircling the copper rod by gyroscopic

phenomenon and following Fleming's rule. The product is very low voltage (few millivolts) as a resultant of the electrons traveling in a circular motion. But, as in any electrical circuit, the EMF in the copper rod is governed by Ohm's law (E/R = I) and will be in the range of several thousand amperes.

The Peltier Effect

In a metal alloy bar (such as constantan, 60% Cu, 40% Ni) one end is heated and the other is maintained cold. When the hot end is heated enough, electrons of nickel and copper atoms become excited. The electrons of nickel force the electrons of copper to reverse orbital spinning (as described in part 1). By centripetal force electrons form the cool side shift toward the hot side. The hot side becomes negative in respect to the cold positive side, exactly opposite to the Thompson effect.

Of course, the Thompson and the Peltier effects are temporary; they last only until the proportion between the cool and the hot side reaches the electrons' numerical balance.

Let's now combine the Thompson and Peltier effects together in the thermocouple fashion. In the Thompson effect the electrons move from the hot side toward the cold side. In the Peltier effect the electrons travel from the cold toward the hot side, and back to the hot side of the copper to complete the circuit. The temporary phenomenon of the Thompson-Peltier effect now combined becomes permanent for as long as the temperatures of the hot and cold junction are maintained unbalanced. In physics this is known as the Seebeck Effect.

Let's now reduce the Peltier Effect rod to the minimum possible length according to the equation:

Con R = Cu R x pi. The electrons, in the reaction phenomenon described in the Thompson Effect, instead of traveling toward the copper hot junction, will be attracted by the centripetal force of the electrons spinning in the Peltier Effect, and the free electrons in the Peltier Effect will be attracted by the hot junction of the Thompson Effect. Furthermore, to obtain a sawtooth effect of a unijunction transistor, a silicon pellet is added between the two cold junctions, and the EMF becomes unidirectional with oscillatory frequency of approximately 1.9 megacycles. In this condition 95% of the EMF traveling in linear velocity motion equal to the heat propagation will be accelerated time and time again by the hot side of the ring, and the resulting kinetic energy in the orbital electrons will be so great that the various electron shells will travel on the same orbital plane. As a result, portions of the atom proton energy will be exposed toward the center of the ring. The phenomena that then occur in the Ring Device are unique in their nature and not replaceable by any artificial means.

In the Ring Device the following phenomena can be detected:

(1) The voltage is maintained at a minimum of 25 to 45 millivolts. This EMF will produce 120 gauss at the ring circumference, and 10 gauss at the center of the ring. This is approximately 5 times the earth's magnetic field. This magnetic field is sufficient to maintain the orientation of the human body, but too weak to jeopardize the orbital spinning in the H bonding of the DNA.

(2) In the electromagnetic field and permanent magnet the electrons travel from the south toward the north pole. If this type of magnetic field is applied to the human body it will have the same deteriorating effect as if the jumper used to start a car is connected to the opposite polarity of the battery. In the ring the EMF travels from the positive pole toward the negative in the same fashion dry batteries are instantly charged by inductive methods.

(3) Like in any electrical circuit, the energy across the ring is regulated by the Ohm law where (E = .045 volt / R= 5 x 10^{-6}) I = 9,000 amp, as explained before.

It is quite obvious that there is enough energy to supply every one of the 6.3 trillion human cells the proper energy needed. The energy from the ring is transferred to the body by an inductive method similar to the one used to instantly charge a dry battery. During the treatment the ring is maintained at constant slow motion of 1-1/2 inch per second. This velocity is sufficient to cause energy transfer from the ring to the body by inductive method, but not fast enough to create any disturbance to the electron orbital spinning in the DNA H bonds. In the process, the parasite cells (cancer cells) are also charged to the energy level of the healthy cells, and like a faulty car battery, they release the energy and reverse polarity at each end of the inductive effect. Four to five passages of the ring near the tumor are sufficient to deprive the cell energy and to reverse the orbital spinning of the electrons in the phosphate bonds. In this condition, the bases of the DNA repel each other and the DNA dissolves. At the end of the cell life span the tumor disappears. Of course, for the Ring to be effective, the treatment must start when the disease is first detected. Radiations of any nature prior to the ring treatment will accelerate the orbital electron spinning in the DNA H bonds and will jeopardize the benefit of the Ring treatment.

From the above clarification it is quite evident that the Ring Device does not remagnetize, reorient, and homogenize the magnetic field in the body by external magnetization, but by energy transfer in the inductive fashion.

Let's explain with an example. Let's consider an electric generator where the rotor is formed of a plurality of magnetic poles. If the rotor is rotated by external means, the coil winding of the stator absorbs and transfers EMF at the expense of the magnetic pole (electric generator).

If the EMF is supplied to the stator winding, the rotor generates power (electric motor) at the expense of external EMF, while the magnetic pole of the rotor will gain intensity.

The human body is like a rotor with an infinite number of poles, DNA frequency, field orientation, etc. By applying energy from the stator (Dotto Ring) the body will create power, while the magnetic level, DNA H bond and the field orientation gain intensity. The Ring then transfers energy to the body and does not force the body to give up energy b means of external magnetic field. Furthermore, as will be explained later, the electrons at the end of sugar phosphate rod and in the atom of hydrogen (H bonds) present at the ends of the bases (nucleotides) have the electron orbital spinning in different directions. This is to ensure that sugar is bonded only with phosphate, adenine only with thymine, and guanine only with cytosine.

When in the 6 billion bases joined together to form the human DNA, one or two electrons spinning in the phosphate bond are forced to reverse orbital direction by means of a cosmic ray, radiation, high energy photon, microwave beam (radar), permanent magnet, high intensity electromagnet, laser, etc., due to the property of the sugar crystal of rotating the plane of polarized light to the right, the DNA immediately will release the hit base and attract a new one to reestablish the genetic code. But now it is quite possible that the new base connects itself upside down: phosphate with phosphate, sugar with sugar, and adenine or thymine with cytosine or guanine. The elements attract each other because of opposite directional spinning of the electrons in the H bonds and not because of different chemical composition.

The DNA now is completed again but with a wrong sequence in the genetic information. By reestablishing the homogeneity of the magnetic orientation of the DNA by means of inductive energy, the wrong base is rejected again and the proper one is attracted. In nature plants like peach, apricot, etc., restore the proper DNA sequence by means of glycosides, always present in the fruit pit. Glycosides are solids, generally crystalline, and most have a bitter taste. Their solution shows the property of rotating the plane of polarized light to the left. Under the

influence of naturally occurring substances (enzymes) present in trace amounts in neighboring cells, glycosides can be split into one or more sugar and non-sugar portions termed Amygdalin.

Amygdalin shows greater property of rotating the plane of polarized light to the left than the crystalline sugar to the right. Under the influence of ultraviolet light coming from the sun, the plane of polarization is shifted to the left, and the proper orbital electron spinning in the phosphate base is restored.

The DNA readjustment effect is proportional, of course, to the amount of ultraviolet light available to the plant. For humans, the use of inductive energy is more effective and less complicated.

The Thompson-Peltier Effect then, such as produced in the Ring Device, is unique in its form and energy creation and cannot be replaced by any artificial means.

The ring is capable of creating a field feasible for use on the human body as a product of a voltage intensity similar to the voltage measured across a normal cell, but with a current intensity greater than the total amount of energy measured across the entire human body (3-6,000 amps).

The Aging Process

To understand the human aging process, let's now examine the structure and the function of the DNA. Imagine a flexible ladder 1 meter (39" long) composed of 6 billion steps. Each step has the form of two capital T's facing each other. The horizontal line of the "T" has 70% of its length made of sugar and 30% of phosphate.

The vertical line is of a different composition: adenine or guanine, or thymine, or cytosine.

At the vertical ends of the "T" there are atoms of hydrogen (The hydrogen, first element in the atomic chart, is composed of one proton and one electron).

Refer now to the alnickel permanent magnet explanation.

At the end of the phosphate rod the orbital electrons spin clockwise. At the end of the sugar rod the orbital electrons spin counter-clockwise. In the hydrogen atoms, at the end of adenine and thymine, the electrons spin clockwise, and in the hydrogen atoms at the end of guanine and cytosine they spin counter-clockwise. This type of "T" is called base or nucleotide. The DNA is then formed by 12 billion nucleotides facing each other and connected in a straight line to form the double helix. This is the genetic code and every one of the 6.3 trillion cells of the human body has at least one.

To form a new cell the DNA must repeat itself. This is accomplished by splitting the ladder along the middle of the step and reforming two DNAs absolutely identical and in the same sequence. To form two DNAs, another 12 billion nucleotides are necessary.

Inside the cell nucleus there are constantly at least 8 different types of virus, 4 RNA types (negative charge) and 4 DNA types (positive charge). Every pair of viruses (one RNA and one DNA type) attracts each other to form a dipole. They do so first to protect themselves against any external magnetic disturbance, and second to accumulate energy in the following manner:

Inactive viruses are crystalline forms, but in active status, such as inside the cell nucleus, they reveal one RNA or DNA core covered with protein. Of course, even inactive status they still maintain all the properties of a crystal, and as a crystal they are very sensitive to the high sound frequencies.

Under sound frequency up to 5 megacycles the two viruses continuously strain each other and produce energy due to the piezoelectric effect (the same principle is used in the energy

conversion of the supersonic generator). In the ultrahigh sound frequency over 5 megacycles, an isolated inactive virus can be excited to alter the transition temperatures or Curie point and disintegrate (Ruben). The human DNA (like a Yogy antenna one meter long) is tuned to any radio emission between 375-385 megacycles)

Furthermore, the DNA is under the constant influence of charged ions traveling through the nervous system and acting as a modulation frequency. The combined action of the two physical phenomena force the DNA to emit a high frequency sound in the range of 1.9-2 megacycles in order to detect, by returning echo, what type of protein is missing in the cell. These sound frequencies are not only necessary to the DNA in scanning the type of RNA to produce, but also to maintain active the virus in bipole form by means of the strain effect.

To control the energy level from the piezoelectric effect, the RNA type virus covers itself with phosphate and the DNA type virus with sugar. In forming this special type of coating the virus, like any living organism, produces waste. These wastes are accumulated in the center of the rod just formed and will be called adenine, guanine, thymine or cytosine according to the type of virus in the bipole. The process to make the coating is accomplished at the expense of the electrical charge accumulated by the piezoelectric effect. At the end of the charge, to remain active the group of viruses removes the coating that now is in the form of a capital "T" and exposes itself to the high frequency sound produced by the DNA and the process starts all over again.

Due to the described phenomena, the DNA has always enough bases available to produce RNA strains and to reproduce itself. Now, let's go back to the flexible ladder composed of 6 billion steps. Suppose we twist this strange ladder so many times to have only a few steps for every turn of the coil so formed (these coils are called base pair per turn). Since every base has a different polarity according to the code formed by passed generations, the DNA can be compared to the multi-polarity rotor of an alternator. In the alternator, the speed is inversely proportional to the number of poles and the output power is directly proportional to the energy applied. At every electrical impulse flowing through the nervous system the DNA moves back and forth as many degrees as one base is separated from the next one. The more base pairs per turn the less degree the DNA has to move and less energy is required to make it vibrate.

Then there are three controlling factors for the DNA to reproduce itself and create a new cell:

(1) The kinetic energy of the electron in the H bonds.

(2) The number of the base pair per turn in the double helix.

(3) Energy and the frequency of charged ions traveling along the nervous system; i.e, the DNA of the embryo cell in the mother's womb has 46 base pairs per turn; the kinetic energy of the electrons in the H bond is weak; charged ions coming from the mother's body are strong. Result: the DNA produces one cell per second. After 6 weeks of pregnancy, the DNA in the cell of the embryo has 34 base pairs per turn, the kinetic energy of the electrons in the H bonds increases, the charged ions from the mother are unchanged; the DNA produces one cell every minute, and so on. By the time the fetus is in the 10th lunar month, the single DNA (half from the mother, half from the father) has already reproduced itself more than 6 trillion times.

When the baby is born, the slowing process of reproduction increases. At the age of two, the DNA winds again to have 22 base pairs per turn, 14 at the age of 21, and 10 at the age of 35. From the age of 35 to 55, the 10 base pairs per turn in the DNA do not change. At approximately the age of 55, the base pairs per turn are reduced to 6. By this time, the kinetic energy of the electron in the H bond and the energy of the charged ion become very weak and the DNA stops

reproducing itself, and the aging process beings. To slow down the body aging process, three factors must be considered:

(1) Ways of stretching the DNA to increase the base pairs per turn back up to 10,by means of energy in motion up and down along the body as in the Ring Device.

(2) Increase the electron kinetic energy in the H bonds by means of proton pulling force. The proton energy available (as previously explained) toward the center of the ring is high enough to attract (in the vacuum) one electron 20 feet away)

(3) Increase the energy of the charged ions in the nervous system by means of exercise and proper diet.

At this point it is necessary to clarify one important factor that is the basic secret of life creation. Without explaining the working principle of this secret, we will never understand the vital importance of the homogeneity and orientation of the magnetic field in the human body. All the 6.3 trillion DNAs of the human body are absolutely identical, all are tuned to the same resonance frequency, a;; have exactly the same genetic code sequence. Yet the 6.3 trillion cells in the human body, where each DNA is enclosed, are all different, and each one of these cells fits exactly the proper place and functionality in the human system. How is this possible?

The human DNA, as mentioned before, is approximately 39 inches (1 meter) long and has 6 billion steps formed by 12 billion base pairs. The entire length of the DNA is necessary to maintain and transmit from generation to generation the entire genetic code. Yet only a portion of the DNA (different in every cell) is used to create a specific cell. How is this accomplished?

Suppose we have a thread one meter long. On this thread we insert 46 nylon light beads 1/2 inch long. Now let's insert this strange chain in the center of an electrostatic tube with bipole orientation. After a few seconds all the nylon beads will be charged with the same electrostatic energy and they will repel each other, leaving an interspace between them. They will repel each other, but not with the same force. The interspace between the beads located near the north side of the electrostatic charge will be shorter; gradually toward the opposite polarity of the tube the interspace will be longer. Now the only part of the thread we see is the one not hidden by the beads. Let's now call the thread DNA and the 46 beads chromosomes. Since the chromosomes act as a shield, the only portion of the DNA that controls a specific cell is the one of the interspace between the chromosomes, which for every cell has a different length according to different magnetic intensity, polarity and orientation in the human body. Each chromosome encloses 1,250 DNA lengths (genes) and each gene is formed of 100,000 base pairs (microgene). Of the total 6 billion steps of the ladder (DNA), only 250 million are really controlling the cell life.

The chromosomes appear immediately after the DNA is formed and they disappear when the cell is completed and just before the DNA is ready to repeat itself, to reappear again only in the new DNA. If the chromosomes of the new DNA, due to the phenomenon previously explained, have the wrong interspace sequence, it is quite possible that the DNA will produce, i.e., in the neck a cell that belongs in the kidney or vice versa. This also can be called a cancer.

Furthermore, like in a musical instrument, the sound produced by the DNA in the scanning system has different harmonics according to the chromosome's interspace.

The virus responsible for the creation of nucleotides in a different group of cells of different harmonics, adjusts the equilibrium potentials of the component charges in the crystal lattice. This pressure effect in the electrical field distribution governs the final crystal structure of the many compounds of the virus. If a group of RNA type of virus with a final crystal structure as a result

of harmonics of one group of cells is transferred by means of electromagnetic reaction in a different group of cells, under the influence of the new harmonics, it will alter the transition temperature (Curie point).

In this transaction it will lose the protein coating and release the core DNA to control the protein creation in the new cell (Ruben). As a result, a new type of cell will be created different from any surrounding cell, and this also will be a cancer cell.

From the above described phenomenon, well known in physics, the Temin theory that the RNA type virus uses its own RNA core as a template to modify the structure of the genetic code and create the reversal of the DNA is absurd. If the phenomenon exists, it could not be a creation of the present civilization, but has existed from the beginning of time. And there are no records available of claims of apes deriving from humans.

Theories #1 and #4 of the introductory explanation support the principle that some forms of cancer and leukemia are caused by isolated viruses. In this case a physical principle known as the Pyro-Piezoelectric Effect will be with solution of the problem.

If a Rochelle slat crystal is rapidly cooled from 25° to 0° C., the polarization increases so fast that the normal conductivity cannot bring about equilibrium and a transient potential as great as a thousand volts can be produced between two electrodes contacting the crystal (Ruben).

Since in the isolated virus crystal, the RNA or DNA type core acts as an electrode between the two poles, when the voltage potential overcomes the core's DC resistance, the energy discharges across it will be so great as to disintegrate the virus core a common electric fuse. The same phenomena, of course, is applied to the joint virus (one DNA and one RNA type) existing in the cell nucleus and responsible for the DNA creation. Because of the electrical principle that in an inductance, two joint EMFs opposite and contrary eliminate each other, no voltage will appear across the joint virus.

In an experiment with dying AKR mice (mice carrying leukemia), a constant laboratory temperature of 35° was maintained. The cage containing the mice was placed two times a day for 20 minutes each time in a small refrigerator where temperature was kept at 0° C. After 5 days of treatment the mice were sacrificed and pathological studies revealed no evidence of lymphosarcoma. A piezobaric chamber, where a temperature body change of 25° C can be obtained in less than 1 minute, is under construction to repeat the experiment.

Conclusion

By evenly re-establishing the orientation of the body's magnetic field, the virus groups responsible for the manufacture of the nuclei (necessary for the reproduction of the DNA) are bound to stay only in the specific group of cells tuned to their own resonance frequency with no chance of spreading to other parts of the body.

With the correction of the environmental resonance frequency of a group of cells, a virus out of position will become inactive in the same fashion as a portion of a variable capacitor not facing the stator. In Theory #3 (Dotto), the Ring re-establishes the proper number of base pairs per turn on the DNA double helix due to the phenomenon known as the Wunder Effect.

In a vacuum, a suspended secondary coil inserted in a primary coil of fixed number of turns, adjusts itself to the same primary number of turns when voltage is applied, with capability proportional to the current intensity and inversely proportional to the square of the spring reaction strength of the secondary coil. This principle is widely applied in automatic tuning devices for modern color television. By applying to the human body voltage, EMF and magnetic

intensity similar to the value existing in the DNA of normal cells (in the human between the ages of 35 and 55) a voltage of 45 to 75 millivolts maintains a linearity of 10 base pairs per turn in the double helix (Crick-Watson). The DNA of the cancer cell adjusts itself to the proper level of functionality, regardless of cell condition, since absorbed energy will be inversely proportional to the existing cell energy level.

In the case of 6 base pairs per turn in the double helix (humans over 55), when the DNA stops the reproduction capability, the base pairs per turn are triggered back to 10 and remain so as long as the magnetic intensity is reapplied at least once every 14 days. This results in slowing down the aging process.

Another important factor must be clarified: In widely known mice experiments (Presman, Barnothy), a combined action of a constant permanent magnetic field and microwaves in the gigacycle range proved to be very effective in causing tumor regression in mice. This phenomenon is caused by the disturbance action of the microwaves on the normal orbital spinning of electrons in the DNA H bonds. But we must not forget that to the humans we must give the right to live, not merely to survive. However, frequency in the range of 1 to 3 mc and modulation frequency of 80 to 200 kc is known to penetrate deeper into the human body and is capable of breaking the thin skin of the cancer cell without jeopardizing the DNA code of normal cells (Presman).

For this reason, the Ring is pretuned on the Peltier junction to the average frequency of 1.8 mc and modulation frequency of 100 kc to obtain a current fluctuation chopping effect similar to a unijunction transistor. The Ring also is a 350 ohms television antenna, where the lower band resonance is tuned to a VHF (Thompson Effect junction) and the upper band (Peltier junction) is tuned to UHF resonance. The upper frequency then maintains the activity of the normal cell on the correct level, while the penetrating low frequency neutralizes the activity of the cancer cell.

Theory #2, which postulates that cancer cells, to some extent, may be considered as parasitic cells, is proven correct as far as the Ring is concerned. The Ring is an inductive coil. In the motion along the body, the Ring recharges the cells to the proper desired level. While the normal cells retain the charge, the cancer cells behave like a faulty battery. At the passage of the Ring, the temporary magnetic charge collapses in the same fashion as transformer laminations.

This collapsing effect is detectable by electrodes of an EEG sensitive to electrical brain impulses. By synchronizing a recorder to the Ring velocity, the location of the collapsing tumor can be detected within 5 cm accuracy.

Many years of investigation have proved the Ring to have no detrimental or side effects. On the contrary, it has proved to be very helpful for people who have suffered form exposure to radiation, cobalt, linear accelerators, etc.

For all the reasons stated above, the Ring should be considered primarily as a tool for physicians in disease prevention and disease control, rather than a cure.

Signed,

Dr. Gianni A. Dotto
(8 February, 1972)

---

http://orgoneproducts.org/blog/anti-aging-device-electromagnetic-radio-frequency-generator/

DOTTO RING

Anti Aging Device- Electromagnetic Radio Frequency generator

The last month has been an Odyssey. The good news the Radio Frequency version of the Dotto Ring is in. I will call it the Heavy Gravity machine for now. The field strenght is about 120 Gauss with a frequency of 1.9MHz. This is the frequency that Dotto claims triggers DNA replication. Anyone interested in this device, I urge them to read up on Dotto.

The Reader's Digest is that Gravity=Life. More gravity=More Life or Negative Entropy or Anti-aging. Dotto studied an area in Northern Pakistan called the Hunza valley where the average lifespan was over 120 years old. Most people attribute the longevity of the Hunza's to the food and the water found in that particular area. Dotto discounted this as the reason for the long lifespans. Dotto said the region contained magnetic anomalies not found anywhere else in the world. The Hunza valley has a unique juxtaposition of a mountainous glacier area next to a hot valley. Dotto states that it is the thermal unbalance of the region that creates a magnetic field stronger than the surrounding area.

The original Dotto Ring is a Thermo-couple that creates a hot and cold magnetic field equivalent to 5X the field strenght of the Hunza valley. According to the legend, Dotto reversed people's age over 20 years. The premise is that the device created magnetic induction or energy transfer directly into the DNA. The DNA is a spiraling coil like a caduceus, as you age the coil shortens and tightens as a function of conservation of energy.

The DNA bases are proteins that hold magnetic charge like a battery. The proteins convert the magnetic energy into electrical energy to run the processes of the cells. This is known as pre-natal chi by the Chinese. The Chinese system believes you have a limited amount of pre-natal Chi and that once it is exhausted you die.

The RNA is on both ends of a DNA base, as the cells replicate pieces of the RNA are lost. The RNA strands shorten until they are too short to communicate to the DNA to split.

This essentially is also death from a western scientific point of view. In addition as the DNA coil shortens and tightens electrical impedance increases. Electricity is harder to run through the DNA coil. The replication process slows down as impedance increases. As you age you notice, you do not have as much energy and you need to sleep more. The feeling that people are growing younger around you and that you are growing older is another function of loss of energy within your genetics. The Bible has stories of people living for close to 1000 years old. We live for approximately 120, why the difference?

GRAVITY… and the use of Nuclear weapons. The garden of Eden was a heavier gravitational environment. Nuclear radiation has degraded our DNA through unhealthy mutations. Essentially genetics is a function of consciousness, higher evolved beings have longer DNA strands. There are functions within the junk DNA, that when rearranged will lead to much extended lifespans. My contention is that this can be achieved in this lifetime with the use of Bridge technologies such as the Heavy Gravity machine.

Now for the test results since I have received the machine on Feb 19th. For now all experiences are anecdotal and not the result of any medical tests. While the device is on after about 10 minutes, it triggers a response from the parasympathetic nervous system. That is relaxation, it nothing else happens it is a great meditation machine. The connective tissue in the body starts to soften and relaxation flows everywhere. Bowels movements are heavy, who needs colonics. The first two treatments my eyes were hurting while the machine was on. I am now noticing a month later, I am not squinting nearly as much. The most remarkable improvement has been my

hearing, I can hear out of my right ear as well as my left now. There is surprisingly little wax buildup either even though I am a habitual cellphone user.

Over the last month I have had a tremendous amount of stress, tax troubles, family members dying and possible harassment from my new landlord due to condo conversion, yet I have held together and accomplished more in the last month than at any previous time in my life. This I attribute to the machine. Emotional detox, wow! The machine seems to work on different areas of the body almost like it is alive, quite strange. On two separate occasions, my liver was moving like a heartbeat and the rage that was coming off it was intense. I would say probably limit treatments to 30 minutes per day to start and not the 2 hours or more that I do. I have lost weight from my midsection, this may be due to bowel movements or perhaps there is a switch in the type of hormones being released into my bloodstream. I don't need as much sleep and definitely have more energy. For now I am much more emotionally reactive, moving from vulnerable states to angry and vengeful. These moods pass quickly and are akin to the Reichian therapy sessions I use to go through. Organ pulsation is a sign of body armoring dissolving and the person becoming whole.

I am a lot less self-conscious and more spontaneous in the last month, I seem to just do things without thinking. One of the thought forms that I have been focusing on generating on the last few years is unlimited abundance, the irony of the recent problems with my landlord may lead to a buyout of my apartment, an interesting way to create abundance. What I am beginning to see is that this device creates compression, everything seems to speed up.

US Patent # 3,839,771

Method for Constructing a Thermionic Couple

October 8, 1974

Giani A. Dotto

Abstract

A method for constructing a thermionic couple comprising an apparatus in the form of a ring or loop of metal such as copper having high electrical and thermal conductivity. The ring has spaced ends forming a gap joined by a bridge member formed of material having significantly lower electrical and thermal conductivity than the ring. A substantial thermal unbalance is induced between the junctions of the ring and the ring member. The width of the gap and the effective length of the bridge member is adjusted to produce a recurrent thermoelectric balance, resulting in repeated changed in the energy level of the metal atoms of the ring.

Summary

In a typical embodiment of the present invention, an electrically and thermally conductive metal strip has end portions thereof bridged by a member of a material having substantially different thermoelectric properties. Means are provided to establish a substantial temperature difference between the opposite end portions of the metal strip and bridge member, with an appropriate adjustment being made with respect to the point of connection of the bridge to one end portion of the strip, to provide a loop wherein oscillation involving high electrical excursions occurs, resulting in continuing changes in energy levels of the metal atoms in the strip.

Figure 1 is a plan view of one embodiment of the apparatus.

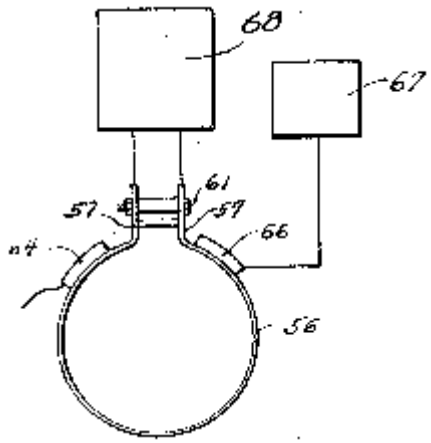
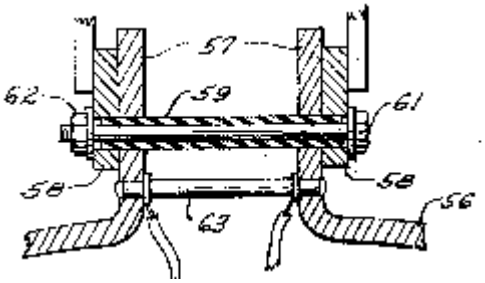


Figure 2 is an enlarged fragmentary section showing detail of the bridge member and opposite ends of the ring of the embodiment in my invention shown in Figure 1.



Description of the Preferred Embodiments

Referring now to Figure 1 and Figure 2, a ring or loop 56 is formed with spaced apart ends 57 defining a gap therebetween. In an embodiment of the invention constructed and operated successfully, the ring was formed of a copper bar having a width of 9 inches and a thickness of 1/2 inch, formed into a loop approximately 27 inches in diameter, with a gap between the ears 57. The copper material used was an annealed copper having a purity of 99.99% copper, and an electrical resistance of [1.7 microhm-cm] ohms-circular mil per foot at 20° C. This is the international standard of resistance for annealed copper and is equal to 100% electrical conductivity. The thermal conductivity of this copper is in the order of 1 calorie per second through a thickness of 1 cm and across an area of one square cm at a temperature difference of 1° C.

On the outer sides of the ears 57 there are blocks 58 of insulating material which are both electrically and thermally insulative. Insulating tubes 59 (one shown in Figure 2) extend through the blocks 58 and the ears 57, providing an insulating passage for bolts 61 having suitable threaded fasteners 62 at one or both ends. This provides a means for adjusting the gap between the ears 57 without short-circuiting across the gap either thermally or electrically.

Attached to the ears 57, as by brazing or the like, is a bridge member 63 forming a separate "short circuit" electrical and thermal path between the ears, apart from the continuity of the bar. The bridge member is formed of one or more rods of a metal alloy such as Constantan, which is an alloy of essentially 60% copper and 40% nickel., having a significantly lower electrical and thermal conductivity than the copper bar and hence a significantly higher electrical and thermal resistance than the ring 56. For example, Constantan has an electrical resistivity in the order of

49 microhm-centimeter at 20° C and a thermal conductivity in the order of 0.054 calories per second through a thickness of 1 centimeter across one square centimeter at a temperature of 1° C.

A means for heating one end of the ring 56 is provided in the form of an electrical heater 64 connected to a suitable source of electrical power, and in the case of the specific device disclosed, having a capacity of 6000 watts and a heat exchanging area on the order of 200 square inches. A means for cooling the other end of the ring 56 is provided in the form of a refrigerating coil 66 connecting through suitable tubing to a refrigerating unit 67. In the case of the specific device disclosed, the refrigerating unit has a cooling capacity of 10,000 BTU and the cooling coil 24 has a heat exchanging area on the order of 200 square inches.

A two-channel electroencephalograph 68 (Figure 1) has one of its channels connected to the ears 57, to record the potential difference between the junctions of the ears and the bridge member. While operating the heating and cooling means, and observing the output of the oscillograph, the apparatus is initially "tuned" by fastening one end of the bridge member 63 to one of the ears 57, having the other end of the bridge member in contact with the other ear, and adjusting the threaded fasteners of the bolts 61 until the output in the oscillograph is observed to fluctuate in recurrent cyclic fashion. When this condition is achieved, the other end of the bridge member 63 is brazed to the other ear 57 of the ring.

Potential differences between the ears 57 have been recorded in the order of 0.156 millivolts, and the electrical resistance of the ring is in the order of 5.27×10^{-6} ohms. According to Ohm's Law, these conditions would indicate a current in the order of 30,000 amperes, at a frequency which, from observing the oscillograph readings, is in the order of 100 kilocycles per second with a modulation frequency of 10 kilocycles.

It appears that in operation of the device there is a change caused in the energy level of the electrons of the metal (copper) atoms, which is exhibited in a form of electron acceleration around the ring. No electron emission from the ring has been observed, by irradiating the ring with ultraviolet light during operation of the device, whereupon a pale blue-white "halo" appears about the ring or by enclosing the ring in a foggy chamber "curie" method. On the other hand, if a bar of cadmium is positioned in the center of the ring and the bar is heated high enough to thermally excite the kinetic energy of the outer orbit electrons to a point where their kinetic energy ($1/2\ MV^2$) will be greater than the work function and allow discharge into space, the electron will be attracted by the proton energy of the ring. The phenomenon is shown by the deposit of cadmium on the internal service of the copper ring as if cadmium-plated.

It is sometimes desirable to maintain the magnetic field of the ring between 240 and 160 Gauss. The amount of energy is determined by the temperature difference and the amount of resistance in the ring. The high temperatures are obtained by conventional electrical heaters. As an example. A heater having three elements, each one with a 1,000 watt rating, may be used. It is desirable to obtain a temperature of about 600° to 800° F. For the cold side a conventional coil like that of a freezer cabinet can be used, and connected to a refrigeration compressor.

The invention claimed is:

(1) The method of constructing a thermionic couple capable of exhibiting a cyclic thermionic unbalance in operation, comprising the steps of:

forming a ring of material such as copper having a low electrical resistivity in the order of 1.7 microhm-cm (at 20° C) and a relatively high thermal conductivity in the order of one calorie per second through a thickness of 1 cm and across an area of 1 square cm at a temperature difference of 1° C, with the ends of the ring defining a gap therebetween;

forming a bridge member spanning said gap of a material such as Constantan, having a significantly higher electrical resistivity, in the order of 49 microhm-cm (at 20° C) and a significantly lower thermal conductivity in the order of 0.054 calories per second through a thickness of 1 cm across an area of 1 square cm at a temperature difference of 1° C;

causing a substantial temperature difference between the ends of said ring to induce an electrical potential gradient between the ends of said ring;

placing the bridge member in contact with the ends of said ring resistance between the ends of said ring;

measuring the potential difference between the rods of said ring while the temperature difference is induced;

and adjusting the spacing between the ends of said rings and hence adjusting the effective length of the bridge member until the observed potential difference fluctuates in a cyclic manner;

and then securing said bridge member to the ends of said ring.

US Patent # 3,785,383

Electrostatic Wand

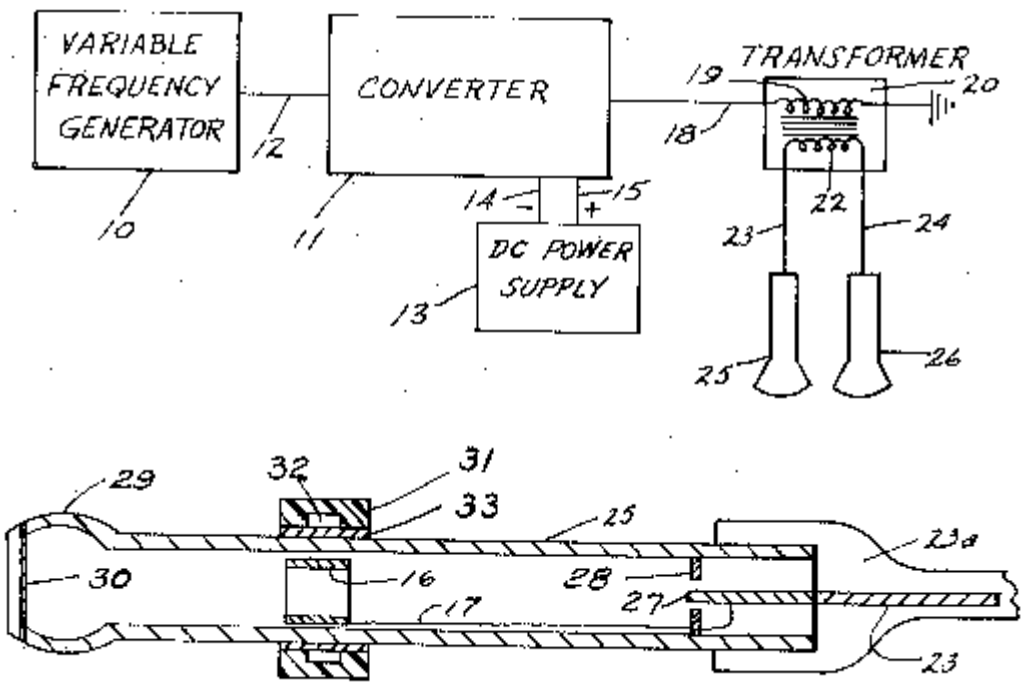
by

Gianni A. Dotto

(January 15, 1974)

Abstract --- Electrostatic means radiating electrical energy at selected frequencies of the order of megacycles per second is safely and harmlessly coupled capacitatively to tissue structure of a human being or of an animal with no significant flow of electrons for reducing sensitivity to pain, at least temporarily. The radiating means may comprise an evacuated glass envelop of inert gas and also contain an electrode that is intermittently subjects to an electropositive voltage during certain portions of the cycle to promote positive space charges within the envelope together with a controlled amount of ionization of said atmosphere and the production of selected forms of electromagnetic radiation such as infrared light, ultraviolet light, visible light, an mixtures thereof.

Figures



Electro-Gravitics Systems

(An examination of electrostatic motion, dynamic counterbary and barycentric control)

***Report* GRG-013/56 (February 1956)**

Gravity Research Group ~ Aviation Studies (Int'l.) Ltd. ~ Special Weapons Study Unit
29-31 Cheval Place, Knightsbridge, London, S.W.7, England

[Introduction: Electrogravitic Systems]

[Discussion]

[Conclusions]

[Appendix I: Aviation Report extracts]

[Appendix II: Electrostatic Patents]

Electrogravitic Systems ~

An examination of electrostatic motion, dynamic counterbary and barycentric control.

It has been accepted as axiomatic that the way to offset the effects of gravity is to use a lifting surface and considerable molecular energy to produce a continuously applied force that, for a

limited period of time, can remain greater than the effects of gravitational attraction. The original invention of the glider and evolution of the briefly self-sustaining glider, at the turn of the century led to progressive advances in power and knowledge. This has been directed to refining the classic Wright Brothers' approach. Aircraft design is still fundamentally as the Wrights adumbrated it, with wings, body, tails, moving or flapping controls, landing gear and so forth. The Wright biplane was a powered glider, and all subsequent aircraft, including the supersonic jets of the nineteen-fifties are also powered gliders. Only one fundamentally different flying principle has so far been adopted with varying degrees of success. It is the rotating wing aircraft that has led to the jet lifters and vertical pushers, coleopters, ducted fans and lift induction turbine propulsion systems.

But during these decades there was always the possibility of making efforts to discover the nature of gravity from cosmic or quantum theory, investigation and observation, with a view to discerning the physical properties of aviation's enemy.

It has seemed to Aviation Studies that for some time insufficient attention has been directed to this kind of research. If it were successful such developments would change the concept of sustentation, and confer upon a vehicle qualities that would now be regarded as the ultimate in aviation.

This report summarizes in simple form the work that has been done and is being done in the new field of electrogravitics. It also outlines the various possible lines of research into the nature and constituent matter of gravity, and how it has changed from Newton to Einstein to the modern Hlavaty concept of gravity as an electromagnetic force that may be controlled like a light wave.

The report also contains an outline of opinions on the feasibility of different electrogravitics systems and there is reference to some of the barycentric control and electrostatic rigs in operation.

Also included is a list of references to electrogravitics in successive Aviation Reports since a drive was started by Aviation Studies (International) Limited to suggest to aviation business eighteen months ago that the rewards of success are too far-reaching to be overlooked, especially in view of the hopeful judgement of the most authoritative voices in microphysics. Also listed are some relevant patents on electrostatics and electrostatic generators in the United States, United Kingdom and France.

Gravity Research Group
(25 February 1956)

Discussion ~

Electrogravitics might be described as a synthesis of electrostatic energy used for propulsion - either vertical propulsion or horizontal or both - and gravitics, or dynamic counterbary, in which energy is also used to set up a local gravitational force independent of the earth's.

Electrostatic energy for propulsion has been predicted as a possible means of propulsion in space when the thrust from a neutron motor or ion motor would be sufficient in a dragless environment to produce astronomical velocities. But the ion motor is not strictly a part of the science of electrogravitics, since barycentric control in an electrogravitics system is envisaged for a vehicle operating within the earth's environment and it is not seen initially for space application. Probably large scale space operations would have to await the full development of electrogravitics to enable large pieces of equipment to be moved out of the region of the earth's strongest gravity effects. So, though electrostatic motors were thought of in 1925, electrogravitics had its birth after the War, when Townsend Brown sought to improve on the

various proposals that then existed for electrostatic motors sufficiently to produce some visible manifestation of sustained motion. Whereas earlier electrostatic tests were essentially pure research, Brown's rigs were aimed from the outset at producing a flying article. As a private venture he produced evidence of motion using condensers in a couple of saucers suspended by arms rotating round a central tower with input running down the arms. The massive-k situation was summarized subsequently in a report, Project Winterhaven, in 1952. Using the data some conclusions were arrived at that might be expected from ten or more years of intensive development - similar to that, for instance, applied to the turbine engine. Using a number of assumptions as to the nature of gravity, the report postulated a saucer as the basis of a possible interceptor with Mach 3 capability. Creation of a local gravitational system would confer upon the fighter the sharp-edged changes of direction typical of motion in space.

The essence of electrogravitics thrust is the use of a very strong positive charge on one side of the vehicle and a negative on the other. The core of the motor is a condenser and the ability of the condenser to hold its charge (the k-number) is the yardstick of performance. With air as 1, current dielectrical materials can yield 6 and use of barium aluminate can raise this considerably, barium titanium oxide (a baked ceramic) can offer 6,000 and there is promise of 30,000, which would be sufficient for supersonic speed.

The original Brown rig produced 30 fps on a voltage of around 50,000 and a small amount of current in the milliamp range. There was no detailed explanation of gravity in Project Winterhaven, but it was assumed that particle dualism in the subatomic structure of gravity would coincide in its effect with the issuing stream of electrons from the electrostatic energy source to produce counterbary. The Brown work probably remains a realistic approach to the practical realization of electrostatic propulsion and sustentation. Whatever may be discovered by the Gravity Research Foundation of New Boston a complete understanding and synthetic reproduction of gravity is not essential for limited success. The electrogravitics saucer can perform the function of a classic lifting surface - it produces a pushing effect on the under surface and a suction effect on the upper, but, unlike the airfoil, it does not require a flow of air to produce the effect.

First attempts at electrogravitics are unlikely to produce counterbary, but may lead to development of an electrostatic VTOL vehicle. Even in its developed form this might be an advance on the molecular heat engine in its capabilities. But hopes in the new science depend on an understanding of the close identity of electrostatic motivating forces with the source and matter of gravity. It is fortuitous that lift can be produced in the traditional fashion and if an understanding of gravity remains beyond full practical control, electrostatic lift might be an adjunct of some significance to modern thrust producers. Research into electrostatics could prove beneficial to turbine development, and heat engines in general, in view of the usable electron potential round the periphery of any flame. Materials for electrogravitics and especially the development of commercial quantities of high-k material is another dividend to be obtained from electrostatic research even if it produces no counterbary. This is a line of development that Aviation Studies, Gravity Research Group is following.

One of the interesting aspects of electrogravitics is that a breakthrough in almost any part of the broad front of general research on the intranuclear processes may be translated into a meaningful advance towards the feasibility of electrogravitics systems. This demands constant monitoring in the most likely areas of the physics of high energy sub-nuclear particles. It is difficult to be overoptimistic about the prospects of gaining so complete a grasp of gravity while the world's physicists are still engaged in a study of fundamental particles - that is to say those that cannot be broken down any more. Fundamental particles are still being discovered - the most recent was

the Segre-Chamberlain-Wiegand attachment to the bevatron, which was used to isolate the missing anti-proton, which must - or should be presumed to - exist according to Dirac's theory of the electron.

Much of the accepted mathematics of particles would be wrong if the anti-proton was proved to be non-existent. Earlier Eddington has listed the fundamental particles as:

e. The charge of an electron

m. The mass of an electron.

M. The mass of a proton.

h. Planck's constant

c. The velocity of light.

G. The constant of gravitation, and

lambda. The cosmical constant.

It is generally held that no one of these can be inferred from the others. But electrons may well disappear from among the fundamental particles, though, as Russell says, it is likely that e and m will survive. The constants are much more established than the interpretation of them and are among the most solid of achievements in modern physics.

Gravity may be defined as a small scale departure from Euclidean space in the general theory of relativity. The gravitational constant is one of four dimensionless constants: first, the mass relation of the nucleon and electron. Second is (e*e)/(h*c) [equation form], third, the Compton wavelength of the proton, and fourth is the gravitational constant, which is the ratio of the electrostatic to the gravitational attraction between the electron and the proton.

One of the stumbling blocks in electrogravitics is the absence of any satisfactory theory linking these four dimensionless quantities. Of the four, moreover, gravity is decidedly the most complex, since any explanation would have to satisfy both cosmic and quantum relations more acceptably and intelligibly even than in the unified field theory. A gravitational constant of around $10.E^{-39}$ has emerged from quantum research and this has been used as a tool for finding theories that could link the two relations. This work is now in full progress, and developments have to be watched for the aviation angle. Hitherto Dirac, Eddington, Jordan and others have produced differences in theory that are too wide to be accepted as consistent. It means therefore that (i) without a cosmical basis, and (ii) with an imprecise quantum basis and (iii) a vague hypothesis on the interaction, much remains still to be discovered. Indeed some say that a single interacting theory to link up the dimensionless constants is one of three major unresolved basic problems of physics. The other two main problems are the extension of quantum theory and a more detailed knowledge of the fundamental particles.

All this is some distance from Newton, who saw gravity as a force acting on a body from a distance, leading to the tendency of bodies to accelerate towards each other. He allied this assumption with Euclidean geometry, and time was assumed as uniform and acted independently of space. Bodies and particles in space normally moved uniformly in straight lines according to Newton, and to account for the way they sometimes do not do so, he used the idea of a force of gravity acting at a distance, in which particles of matter cause in others an acceleration proportional to their mass, and inversely proportional to the square of the distance between them.

But Einstein showed how the principle of least action, or the so-called cosmic laziness means that particles, on the contrary, follow the easiest path along geodesic lines and as a result they get

readily absorbed into space-time. So was born non-linear physics. The classic example of non-linear physics is the experiment in bombarding a screen with two slits. When both slits are open particles going through are not the sum of the two individually but follows a non-linear equation. This leads on to wave-particle dualism and that in turn to the Heisenberg uncertainty principle in which an increase in accuracy in measurement of one physical quantity means decreasing accuracy in measuring the other. If time is measured accurately energy calculations will be in error; the more accurate the position of a particle is established the less certain the velocity will be; and so on. This basic principle of the acausality of microphysics affects the study of gravity in the special and general theories of relativity. Lack of pictorial image in the quantum physics of this interrelationship is a difficulty at the outset for those whose minds remain obstinately Euclidean.

In the special theory of relativity, space-time is seen only as an undefined interval which can be defined in any way that is convenient and the Newtonian idea of persistent particles in motion to explain gravity cannot be accepted. It must be seen rather as a synthesis of forces in a four dimensional continuum, three to establish the position and one the time. The general theory of relativity that followed a decade later was a geometrical explanation of gravitation in which bodies take the geodesic path through space-time. In turn this means that instead of the idea of force acting at a distance it is assumed that space, time, radiation and particles are linked and variations in them from gravity are due rather to the nature of space.

Thus gravity of a body such as the earth instead of pulling objects towards it as Newton postulated, is adjusting the characteristics of space and, it may be inferred, the quantum mechanics of space in the vicinity of the gravitational force. Electrogravitics aims at correcting this adjustment to put matter, so to speak, 'at rest'.

One of the difficulties in 1954 and 1955 was to get aviation to take electrogravitics seriously. The name alone was enough to put people off. However, in the trade much progress has been made and now most major companies in the United States are interested in counterbary. Groups are being organised to study electrostatic and electromagnetic phenomena. Most of industry's leaders have made some reference to it. Douglas has now stated that it has counterbary on its work agenda but does not expect results yet awhile. Hiller has referred to new forms of flying platform, Glenn Martin say gravity control could be achieved in six years, but they add that it would entail a Manhattan District type of effort to bring it about. Sikorsky, one of the pioneers, more or less agrees with the Douglas verdict and says that gravity is tangible and formidable, but there must be a physical carrier for this immense trans-spatial force. This implies that where a physical manifestation exists, a physical device can be developed for creating a similar force moving in the opposite direction to cancel it. Clarke Electronics state they have a rig, and add that in their view the source of gravity's force will be understood sooner than some people think. General Electric is working on the use of electronic rigs designed to make adjustments to gravity - this line of attack has the advantage of using rigs already in existence for other defence work. Bell also has an experimental rig intended, as the company puts it, to cancel out gravity, and Lawrence Bell has said he is convinced that practical hardware will emerge from current programs. Grover Leoning is certain that what he referred to as an electro-magnetic contra-gravity mechanism will be developed for practical use. Convair is extensively committed to the work with several rigs. Lear Inc., autopilot and electronic engineers have a division of the company working on gravity research and so also has the Sperry division of Sperry-Rand. This list embraces most of the U.S. aircraft industry. The remainder, Curtiss-Wright, Lockheed, Boeing and North American have not yet declared themselves, but all these four are known to be in various stages of study with and without rigs.

In addition, the Massachusetts Institute of Technology is working on gravity, the Gravity Research Foundation of New Boston, the Institute for Advanced Study at Princeton, the CalTech Radiation Laboratory, Princeton University and the University of North Carolina are all active in gravity. Glenn L. Martin is setting up a Research Institute for Advanced Study which has a small staff working on gravity research with the unified field theory and this group is committed to extensive programs of applied research. Many others are also known to be studying gravity, some are known also to be planning a general expansion in this field, such as in the proposed Institute for Pure Physics at the University of North Carolina.

A certain amount of work is also going on in Europe. One of the French nationalized constructors and one company outside the nationalized elements have been making preliminary studies, and a little company money has in one case actually been committed. Some work is also going on in Britain where rigs are now in existence. Most of it is private venture work, such as that being done by Ed Hull a colleague of Townsend Brown who, as much as anybody, introduced Europe to electrogravitics. Aviation Studies' Gravity Research Group is doing some work, mainly on k studies, and is sponsoring dielectric investigations.

One Swedish company and two Canadian companies have been making studies, and quite recently the Germans have woken up to the possibilities. Several of the companies have started digging out some of the early German papers on wave physics. They are almost certain to plan a gravitics program. Curiously enough the Germans during the war paid no attention to electrogravitics. This is one line of advance that they did not pioneer in any way and it was basically a U.S. creation. Townsend Brown in electrogravitics is the equivalent of Frank Whittle in gas turbines. This German overlooking of electrostatics is even more surprising when it is remembered how astonishingly advanced and prescient the Germans were in nuclear research. (The modern theory of making thermonuclear weapons without plutonium fission initiators returns to the original German idea that was dismissed, even ridiculed. The Germans never went very far with fission, indeed they doubted that this chain would ever be made to work. The German air industry, still in the embryo stage, has included electrogravitics among the subjects it intends to examine when establishing the policy that the individual companies will adopt after the present early stage of foreign licence has enabled industry to get abreast of the other countries in aircraft development.

It is impossible to read through this summary of the widening efforts being made to understand the nature of matter of gravity without sharing the hope that many groups now have, of major theoretical breakthroughs occurring before very long.

Experience in nucleonics has shown that when attempts to win knowledge on this scale are made, advances are soon seen. There are a number of elements in industry, and some managements, who see gravity as a problem for later generations. Many see nothing in it all and they may be right. But as said earlier, if Dr. Vaclav Hlavaty thinks gravity is potentially controllable that surely should be justification enough, and indeed inspiration, for physicists to apply their minds and for management to take a risk. Hlavaty is the only man who thinks he can see a way of doing the mathematics to demonstrate Einstein's unified field theory - something that Einstein himself said was beyond him. Relativity and the unified field theory go to the root of electrogravitics and the shifts in thinking, the hopes and fears, and a measure of progress is to be obtained only in the last resort from men of this stature.

Major theoretical breakthroughs to discover the sources of gravity will be made by the most advanced intellects using the most advanced research tools. Aviation's role is therefore to impress upon physicists of this calibre with the urgency of the matter and to aid them with

statistical and peripheral investigations that will help to clarify the background to the central mathematical and physical puzzles. Aviation could also assist by recruiting some of these men as advisers. Convair has taken the initiative with its recently established panel of advisers on nuclear projects, which include Dr. Edward Teller of the University of California. At the same time much can be done in development of laboratory rigs, condenser research and dielectric development, which do not require anything like the same cerebral capacity to get results and make a practical contribution

As gravity is likely to be linked with the new particles, only the highest powered particle accelerators are likely to be of use in further fundamental knowledge. The country with the biggest tools of this kind is in the best position to examine the characteristics of the particles and from those countries the greatest advances seem most likely.

Though the United States has the biggest of the bevatron - the Berkeley bevatron is 6.2 bev - the Russians have a 10 bev accelerator in construction which, when it is completed, will be the world's largest. At Brookhaven a 25 bev instrument is in development which, in turn, will be the biggest. Other countries without comparable facilities are of course at a great disadvantage from the outset in the contest to discover the explanation of gravity. Electrogravitics, moreover, unfortunately competes with nuclear studies for its facilities. The clearest thinking brains are bound to be attracted to localities where the most extensive laboratory equipment exists. So, one way and another, results are most likely to come from the major countries with the biggest undertakings. Thus the nuclear facilities have a direct bearing on the scope for electrogravitics work.

The OEEC report in January made the following points:

The U.S. has six to eight entirely different types of reactor in operation and many more under construction. Europe has now two different types in service.

The U.S. has about 30 research reactors plus four in Britain,, two in France.

The U.S. has two nuclear-powered marine engines. Europe has none, but the U.K. is building one.

Isotope separation plants for the enrichment of uranium in the U.S. are roughly 11 times larger than the European plant in Britain.

Europe's only heavy water plant (in Norway) produces somewhat less than one-twentieth of American output.

In 1955 the number of technicians employed in nuclear energy work in the U.S. was about 15,000; there are about 5,000 in Britain, 1,800 in France, and about 19,000 in the rest of Europe. But the working party says that pessimistic conclusions should not be drawn from these comparisons. European nuclear energy effort is unevenly divided at the moment, but some countries have notable achievements to their credit and important developments in prospect. The main reason for optimism is that, taken as a whole, "Europe's present nuclear effort falls very far short of its industrial potential".

Though gravity research, such as there has been of it, has been unclassified, new principles and information gained from the nuclear research facilities that have a vehicle application is expected to be withheld.

The heart of the problem to understanding gravity is likely to prove to be the way in which the very high energy sub-nuclear particles convert something, whatever it is, continuously and automatically into the tremendous nuclear and electromagnetic forces. Once this key is

understood, attention can later be directed to finding laboratory means of duplicating the process and reversing its force lines in some local environment and returning the energy to itself to produce counterbary. Looking beyond it seems possible that gravitation will be shown to be a part of the universal electro-magnetic processes and controlled in the same way as a light wave or radio wave. This is a synthesis of the Einstein and Hlavaty concepts. Hence it follows that though in its initial form the mechanical processes for countering gravity may initially be massive to deal with the massive forces involved, eventually this could be expected to form some central power generation unit. Barycentric control in some required quantity could be passed over a distance by a form of radio wave. The prime energy source to energise the waves would of course be nuclear in its origins.

It is difficult to say which lines of detailed development being processed in the immediate future is more likely to yield significant results. Perhaps the three most promising are: first, the new attempt by the team of men led by Chamberlain working with the Berkeley bevatron to find the anti-neutron, and to identify more of the characteristics of the anti-proton* and each of the string of high energy particles that have been discovered during recent operation at 6. 2 bev. (* The reaction is as follows: protons are accelerated to 6.2 bev, and directed at a target of copper. When the proton projectile hits a neutron in one of the copper atoms the following emerge: the two original particles (the projectile and the struck neutron) and a new pair of particles, a proton and anti-proton. The anti-proton continues briefly until it hits another proton, then both disappear and decay into mesons.)

A second line of approach is the United States National Bureau of Standards program to pin down with greater accuracy the acceleration values of gravity. The presently accepted figure of 32.174 feet per second per second is known to be not comprehensive, though it has been sufficiently accurate for the limited needs of industry hitherto. The NBS program aims at re-determining the strength of gravity to within one part of a million. The present method has been to hold a ball 16 feet up and chart the elapsed time of descent with electronic measuring equipment. The new program is based on the old, but with this exceptional degree of accuracy it is naturally immensely more difficult and is expected to take 3 years.

A third promising line is the new technique of measuring high energy particles in motion that was started by the University of California last year. This involves passing cosmic rays through a chamber containing a mixture of gas, alcohol and water vapour. This creates charged atoms, or positive ions, by knocking electrons off the gas molecules. A sudden expansion of the chamber results in a condensation of water droplets along the track which can be plotted on a photographic plate. This method makes it easier to assess the energy of particles and to distinguish one from the other. It also helps to establish the characteristics of the different types of particle. The relationship between these high energy particles and their origin, and characteristics have a bearing on electrogravitics in general.

So much of what has to be discovered as a necessary preliminary to gravity is of no practical use by itself. There is no conceivable use, for instance, for the anti-proton, yet its discovery even at a cost of $9-million is essential to check the mathematics of the fundamental components of matter. Similarly it is necessary to check that all the nuclear ghosts that have been postulated theoretically do in fact exist. It is not, moreover, sufficient, as in the past, only to observe the particles by
radiation counters. In each instance a mechanical maze has to be devised and attached to a particle accelerator to trap only the particle concerned. Each discovery becomes a wedge for a deeper probe of the nucleus. Many of the particles of very high energy have only a fleeting

existence and collisions that give rise to them from bevatron bombardment is a necessary prerequisite to an understanding of gravity. There are no shortcuts to this process.

Most of the major programs for extending human knowledge on gravity are being conducted with instruments already in use for nuclear research and to this extent the cost of work exclusively on gravitational examinations is still not of major proportions. This has made it difficult for aviation to gauge the extent of the work in progress on gravity research.

Conclusions ~

1. No attempts to control the magnitude or direction of the earth's gravitational force have yet been successful. But if the explanation of gravity is to be found in the as yet undetermined characteristics of the very high energy particles it is becoming increasingly possible with the bevatron to work with the constituent matter of gravity. It is therefore reasonable to expect that the new bevatron may, before long, be used to demonstrate limited gravitational control.

2. An understanding and identification of these particles is on the frontiers of human knowledge, and a full assessment of them is one of the major unresolved puzzles of the nucleus. An associated problem is to discover a theory to account for the cosmic and quantum relations of gravity, and a theory to link the gravitational constant with the other three dimensionless constants.

3. Though the obstacles to an adequate grasp of microphysics still seem formidable, the transportation rewards that could follow from electrogravitics are as high as can be envisaged. In a weightless environment, movement with sharp-edged changes of direction could offer unique manoeuvrability.

4. Determination of the environment of the anti-proton, discovery of the anti-neutron and closer examination of the other high energy particles are preliminaries to the hypothesis that gravity is one aspect of electromagnetism that may eventually be controlled like a wave. When the structure of the nucleus becomes clearer, the influence of the gravitational force upon the nucleus and the nature of its behaviour in space will be more readily understood. This is a great advance on the Newtonian concept of gravity acting at a distance.

5. Aviation's role appears to be to establish facilities to handle many of the peripheral and statistical investigations to help fill in the background on electrostatics.

6. A distinction has to be made between electrostatic energy for propulsion and counterbary. Counterbary is the manipulation of gravitational force lines; barycentric control is the adjustment to such manipulative capability to produce a stable type of motion suitable for transportation.

7. Electrostatic energy sufficient to produce low speeds (a few thousand dynes, has already been demonstrated. Generation of a region of positive electrostatic energy on one side of a plate and negative on the other sets up the same lift or propulsion effect as the pressure and suction below and above a wing, except that in the case of electrostatic application no airflow is necessary.

8. Electrostatic energy sufficient to produce a Mach 3 fighter is possible with megavolt energies and a k of over 10,000.

9. k figures of 6,000 have been obtained from some ceramic materials and there are prospects of 30,000.

10. Apart from electrogravitics there are other rewards from investment in electrostatic equipment. Automation, autonetics and even turbine development use similar laboratory facilities.

11. Progress in electrogravitics probably awaits a new genius in physics who can find a single equation to tie up all the conflicting observations and theory on the structure and arrangement of forces and the part the high energy particles play in the nucleus. This can occur any time, and the chances are improved now that bev. energies are being obtained in controlled laboratory conditions.

Appendix I: Extracts from *Aviation Report* ~

Anti-Gravitational Research ~ The basic research and technology behind electro-anti-gravitation is so much in its infancy that this is perhaps one field of development where not only the methods but the ideas are secret. Nothing therefore can be discussed freely at the moment. Very few papers on the subject have been prepared so far, and the only schemes that have seen the light of day are for pure research into rigs designed to make objects float around freely in a box. There are various radio applications, and aviation medicine departments have been looking for something that will enable them to study the physiological effects on the digestion and organs of an environment without gravity. There are however long term aims of a more revolutionary nature that envisage equipment that can defeat gravity. (*Aviation Report,* 20 August 1954)

Managerial Policy For Anti-Gravitics ~ The prospect of engineers devising gravity-defeating equipment - or perhaps it should be described as the creation of pockets of weightless environments - does suggest that as a long term policy aircraft constructors will be required to place even more emphasis on electro-mechanical industrial plant, than is now required for the transition from manned to unmanned weapons. Anti-gravitics work is therefore likely to go to companies with the biggest electrical laboratories and facilities. It is also apparent that anti-gravitics, like other advanced sciences, will be initially sponsored for its weapon capabilities. There are perhaps two broad ways of using the science - one is to postulate the design of advanced type projectiles on their best inherent capabilities, and the more critical parameters (that now constitutes the design limitation) can be eliminated by anti-gravitics. The other, which is a longer term plan, is to create an entirely new environment with devices operating entirely under an anti-gravity envelope. (*Aviation Report,* 24 August 1954)

The Greater The Easier ~ Propulsion and atomic energy trends are similar in one respect: the more incredible the long term capabilities are, the easier it is to attain them. It is strange that the greatest of nature's secrets can be harnessed with decreasing industrial effort, but greatly increasing mental effort. The Americans went through the industrial torture to produce tritium for the first thermonuclear experiment, but later both they and the Russians were able to achieve much greater results with the help of lithium 6 hydride. The same thing is happening in aviation propulsion: the nuclear fuels are promising to be tremendously powerful in their effect, but excessively complicated in their application, unless there can be some means of direct conversion as in the strontium 90 cell. But lying behind and beyond the nuclear fuels is the linking of electricity to gravity, which is an incomparably more powerful way of harnessing energy than the only method known to human intellect at present - electricity and magnetism. Perhaps the magic of barium aluminium oxide will perform the miracle in propulsion that lithium 6 hydride has done in the fusion weapon. Certainly it is a well-known material in dielectrics, but when one talks of massive-k, one means of course five figures. At this early stage it is difficult to relate k to Mach numbers with any certainty, but realizable k can, with some kinds of arithmetic, produce astounding velocities. They are achievable, moreover, with decreasing complexity, indeed the ultimate becomes the easiest in terms of engineering, but the most hideous in terms of theory. Einstein's general theory of relativity is, naturally, and important factor, but some of the postulates appear to depend on the unified field theory, which cannot yet be physically checked

because nobody knows how to do it. Einstein hopes to find a way of doing so before he dies. (*Aviation Report*, 31 August 1954)

Gravitics Formulations ~ All indications are that there has still been little cognizance of the potentialities of electrostatic propulsion and it will be a major undertaking to re-arrange aircraft plants to conduct large-scale research and development into novel forms of dielectric and to improve condenser efficiencies and to develop the novel type of materials used for fabrication of the primary structure. Some extremely ambitious theoretical programs have been submitted and work towards realization of a manned vehicle has begun. On the evidence, there are far more definite indications that the incredible claims are realizable than there was, for instance, in supposing that uranium fission would result in a bomb. At least it is known, proof positive, that motion, using surprisingly low k, is possible. The fantastic control that again is feasible, has not yet been demonstrated, but there is no reason to suppose the arithmetic is faulty, especially as it has already led to a quite brisk example of actual propulsion. That first movement was indeed an historic occasion, reminiscent of the momentous day at Chicago when the first pile went critical, and the phenomenon was scarcely less weird. It is difficult to imagine just where a well-organised examination into long term gravitics prospects would end. Though a circular platform is electrostatically convenient, it does not necessarily follow that the requirements of control by differential changes would be the same. Perhaps the strangest part of this whole chapter is how the public managed to foresee the concept though not of course the theoretical principles that gave rise to it, before physical tests confirmed that the mathematics was right. It is interesting also that there is no point of contact between the conventional science of aviation and the New: it is a radical offshoot with no common principles. Aerodynamics, structures, heat engines, flapping controls, and all the rest of aviation is part of what might be called the Wright Brothers era - even the Mach 2.5 thermal barrier piercers are still Wright Brothers concepts, in the sense that they fly and they stall, and they run out of fuel after a short while, and they defy the earth's pull for a short while. Thus this century will be divided into two parts - almost to the day. The first half belonged to the Wright Brothers who foresaw nearly all the basic issues in which gravity was the bitter foe. In part of the second half gravity will be the great provider. Electrical energy, rather irrelevant for propulsion in the first half becomes a kind of catalyst to motion, in the second half of the century. (*Aviation Report*, 7 September 1954)

Electro-Gravitic Paradox ~ Realization of electrostatic propulsion seems to depend on two theoretical twists and two practical ones. The two theoretical puzzles are: first, how to make a condenser the centre of a propulsion system, and second is how to link the condenser system with the gravitational field. There is a third problem, but it is some way off yet, which is how to manipulate kva for control in all three axes as well as for propulsion and lift. The two practical tricks are first how, with say a Mach 3 weapon in mind, to handle 50,000 kva within the envelope of a thin pancake of 35 feet in diameter and second how to generate such power from within so small a space. The electrical power in a small aircraft is more than is a fair sized community the analogy being that a single rocketjet can provide as much power as can be obtained from the Hoover Dam. It will naturally take as long to develop electro-static propulsion as it has taken to coax the enormous power outputs from heat engines. True there might be a flame in the electro-gravitic propulsion system, but it would not be a heat engine - the temperature of the flame would be incidental to the function of the chemical burning process. The curious thing is that though electro-static propulsion is the antithesis of magnetism,* (* Though in a sense this is true, it is better expressed in the body of this report than it was here in 1954) Einstein's unified field theory is an attempt to link gravitation with electro-magnetism. This all-embracing theory goes on logically from the general theory of relativity, that gives an

ingenious geometrical interpretation of the concept of force which is mathematically consistent with gravitation but fails in the case of electro-magnetism, while the special theory of relativity is concerned with the relationship between mass and energy. The general theory of relativity fails to account for electro-magnetism because the forces are proportional to the charge and not to the mass. The unified field theory is one of a number of attempts that have been made to bridge this gap, but it is baffling to imagine how it could ever be observed. Einstein himself thinks it is virtually impossible. However Hlavaty claims now to have solved the equations by assuming that gravitation is a manifestation of electro-magnetism. This being so it is all the more incredible that electro-static propulsion (with kva for convenience fed into the system and not self-generated) has actually been demonstrated. It may be that to apply all this very abstruse physics to aviation it will be necessary to accept that the theory is more important than this or that interpretation of it. This is how the physical constants, which are now regarded as among the most solid of achievements in modern physics, have become workable, and accepted. Certainly all normal instincts would support the Einstein series of postulations, and if this is so it is a matter of conjecture where it will lead in the long term future of the electro-gravitic science. (*Aviation Report*, 10 September 1954)

Electro-Gravitic Propulsion Situation ~ Under the terms of Project Winterhaven the proposals to develop electro-gravitics to the point of realizing a Mach 3 combat type disc were not far short of the extensive effort that was planned for the Manhattan District (* The proposals, it should be added, were not accepted). Indeed the drive to develop the new prime mover is in some respects rather similar to the experiments that led to the release of nuclear energy in the sense that both involve fantastic mathematical capacity and both are sciences so new that other allied sciences cannot be of very much guide. In the past two years since the principle of motion by means of massive-k was first demonstrated on a test rig, progress has been slow. But the indications are now that the Pentagon is ready to sponsor a range of devices help further knowledge. In effect the new family of TVs would be on the same tremendous scope that was envisaged by the X-1, 2, 3, 4 and 5 and D.558s that were all created for the purpose of destroying the sound barrier - which they effectively did, but it is a process that is taking ten solid years of hard work to complete. (Now after 7 years the X-2 has yet to start its tests and the X-3 is still in performance testing stage). Tentative targets now being set anticipate that the first disc should be complete before 1960 and it would take the whole of the 'sixties to develop it properly, even though some combat things might be available ten years from now. One thing seems certain at this stage, that the companies likely to dominate the science will be those with the biggest computors to work out the ramifications of the basic theory. Douglas is easily the world's leader in computor capacity, followed by Lockheed and Convair. The frame incidentally is indivisible from the engine". If there is to be any division of responsibility it would be that the engine industry might become responsible for providing the electrostatic energy (by, it is thought, a kind of flame) and the frame maker for the condenser assembly which is the core of the main structure. (*Aviation Report*, 12 October 1954)

Gravitics Study Widening ~ The French are now understood to be pondering the most effective way of entering the field of electro-gravitic propulsion systems. But not least of the difficulties is to know just where to begin. There are practically no patents so far that throw very much light on the mathematics of the relation between electricity and gravity. There is, of course, a large number of patents on the general subject of motion and force, and some of these may prove to have some application. There is, however, a series of working postulations embodied in the original Project Winterhaven, but no real attempt has been made in the working papers to go into the detailed engineering. All that had actually been achieved up to just under a year ago was a

series of fairly accurate extrapolations from the sketchy data that has so far been actually observed. The extrapolation of 50 mph to 1,800 mph, however, (which is what the present hopes and aspirations amount to) is bound to be a rather vague exercise. This explains American private views that nothing can be reasonably expected from the science yet awhile. Meanwhile, the NACA is active, and nearly all the Universities are doing work that borders close to what is involved here, and something fruitful is likely to turn up before very long. (*Aviation Report,* 19 October 1954)

Gravitics Steps ~ Specification writers seem to be still rather stumped to know what to ask for in the very hazy science of electro-gravitic propelled vehicles. They are at present faced with having to plan the first family of things - first of these is the most realistic type of operational test rig, and second the first type of test vehicle. In turn this would lead to sponsoring of a combat disc. The preliminary test rigs which gave only feeble propulsion have been somewhat improved, but of course the speeds reached so far are only those more associated with what is attained on the roads rather than in the air. But propulsion is now known to be possible, so it is a matter of feeding enough KVA into condensers with better k figures. 50,000 is a magic figure for the combat saucer - it is this amount of KVA and this amount of k that can be translated into Mach 3 speeds. Meanwhile Glenn Martin now feels ready to say in public that they are examining the unified field theory to see what can be done. It would probably be truer to say that Martin and other companies are now looking for men who can make some kind of sense out of Einstein's equations. There's nobody in the air industry at present with the faintest idea of what it is all about. Also, just as necessary, companies have somehow to find administrators who know enough of the mathematics to be able to guess what kind of industrial investment is likely to be necessary for the company to secure the most rewarding prime contracts in the new science. This again is not so easy since much of the mathematics just cannot be translated into words. You either understand the figures, or you cannot ever have it explained to you. This is rather new because even things like indeterminacy in quantum mechanics can be more or less put into words. Perhaps the main thing for management to bear in mind in recruiting men is that essentially electro-gravitics is a branch of wave technology and much of it starts with Planck's dimensions of action, energy and time, and some of this is among the most firm and least controversial sections of modern atomic physics. (*Aviation Report*, 19 November 1954)

Electrogravitics Puzzle ~ Back in 1948 and '49, the public in the U.S. had a surprisingly clear idea of what a flying saucer should, or could, do. There has never at any time been any realistic explanation of what propulsion agency could make it do those things, but its ability to move within its own gravitation field was presupposed from its manoeuvrability. Yet all this was at least two years before electro-static energy was shown to produce propulsion. It is curious that the public were so ahead of the empiricists on this occasion, and there are two possible explanations. One is that optical illusions or atmospheric phenomena offered a preconceived idea of how the ultimate aviation device ought to work. The other explanation might be that this was a recrudescence of Jung's theory of the Universal Mind which moves up and down in relation to the capabilities of the highest intellects and this may be a case of it reaching a very high peak of perception. But for the air industries to realize an electro-gravitic aircraft means a return to basic principles in nuclear physics, and a re-examination of much in wave technology that has hitherto been taken for granted. Anything that goes any way towards proving the unified field theory will have as great a bearing on electro-gravitics efforts as on the furtherance of nuclear power generally. But the aircraft industry might as well face up to the fact that priorities will in the end be competing with the existing nuclear science commitments. The fact that electro-gravitics has

important applications other than for a weapon will however strengthen the case for governments to get in on the work going on. (*Aviation Report*, 28 January 1955)

Management Note for Electrogravitics ~ The gas turbine engine produced two new companies in the U.S. engine field and they have, between them, at various times offered the traditional primes rather formidable competition. Indeed GE at this moment has, in the view of some, taken the Number Two position. In Britain no new firms managed to get a footing but one, Metro-Vick, might have done if it had put its whole energies into the business. It is on the whole unfortunate for Britain that no bright newcomer has been able to screw up competition in the engine field as English Electric have done in the airframe business. Unlike the turbine engine, electro-gravitics is not just a new propulsion system, it is a new mode of thought in aviation and communications, and it is something that may become all-embracing. Theoretical studies of the science unfortunately have to extend right down to the mathematics of the meson and there is no escape from that. But the relevant facts wrung from the nature of the nuclear structure will have their impact on the propulsion system, the airframe and also its guidance. The airframe, as such, would not exist, and what is now a complicated stressed structure becomes some convenient form of hard envelope. New companies therefore who would like to see themselves as major defence prime contractors in ten or fifteen years time are the ones most likely to stimulate development. Several typical companies in Britain and the U.S. come to mind - outfits like AiResearch, Raytheon, Plessey in England, Rotax and others. But the companies have to face a decade of costly research into theoretical physics and it means a great deal of trust. Companies are mostly overloaded already and they cannot afford it, but when they sit down and think about the matter they can scarcely avoid the conclusion that they cannot afford not to be in at the beginning. (*Aviation Report,* 8 February 1955)

Electro-Gravitics Breakthroughs ~ Lawrence Bell said last week he thought that the tempo of development leading to the use of nuclear fuels and anti-gravitational vehicles (he meant presumably ones that create their own gravitational field independently of the earth's) would accelerate. He added that the breakthroughs now feasible will advance their introduction ahead of the time it has taken to develop the turbojet to its present pitch. Beyond the thermal barrier was a radiation barrier, and he might have added ozone poisoning and meteorite hazards, and beyond that again a time barrier. Time however is not a single calculable entity and Einstein has taught that an absolute barrier to aviation is the environmental barrier in which there are physical limits to any kind of movement from one point in space-time continuum to another. Bell (the company not the man) have a reputation as experimentalists and are not so earthy as some of the other U.S. companies; so while this first judgement on progress with electrogravitics is interesting, further word is awaited from the other major elements of the air business. Most of the companies are now studying several forms of propulsion without heat engines though it is early days yet to determine which method will see the light of day first. Procurement will open out because the capabilities of such aircraft are immeasurably greater than those envisaged with any known form of engine. (*Aviation Report,* 15 July 1955)

Thermonuclear-Electrogravitics Interaction ~ The point has been made that the most likely way of achieving the comparatively low fusion heat needed - l,000,000 degrees provided it can be sustained (which it cannot be in fission for more than a microsecond or two of time) - is by use of a linear accelerator. The concentration of energy that may be obtained when accelerators are rigged in certain ways make the production of very high temperatures feasible but whether they could be concentrated enough to avoid a thermal heat problem remains to be seen. It has also been suggested that linear accelerators would be the way to develop the high electrical energies needed for creation of local gravitational systems. It is possible therefore to imagine that the

central core of a future air vehicle might be a linear accelerator which would create a local weightless state by use of electrostatic energy and turn heat into energy without chemical processes for propulsion. Eventually - towards the end of this century - the linear accelerator itself would not be required and a ground generating plant would transmit the necessary energy for both purposes by wave propagation. (*Aviation Report*, 30 August 1955)

Point About Thermonuclear Reaction Reactors ~ The 20 year estimate by the AEC last week that lies between present research frontiers and the fusion reactor probably refers to the time it will take to tap fusion heat. But it may be thought that rather than use the molecular and chemical processes of twisting heat into thrust it would be more appropriate to use the now heat source in conjunction with some form of nuclear thrust producer which would be in the form of electrostatic energy. The first two Boeing nuclearjet prototypes now under way are being designed to take either molecular jets or nuclear jets in case the latter are held up for one reason or another. But the change from molecular to direct nuclear thrust production in conjunction with the thermonuclear reactor is likely to make the aircraft designed around the latter a totally different breed of cat. It is also expected to take longer than two decades, though younger executives in trade might expect to live to see a prototype. (*Aviation Report,* 14 October 1955)

Electrogravitics Feasibility ~ Opinion on the prospects of using electrostatic energy for propulsion, and eventually for creation of a local gravitational field isolated from the earth's has naturally polarized into the two opposite extremes. There are those who say it is nonsense from start to finish, and those who are satisfied from performance already physically manifest that it is possible and will produce air vehicles with absolute capabilities and no moving parts. The feasibility of a Mach 3 fighter (the present aim in studies) is dependent on a rather large k extrapolation, considering the pair of saucers that have physically demonstrated the principle only a achieved a speed of some 30 fps. But, and this is important, they have attained a working velocity using very inefficient (even by to-day's knowledge) form of condenser complex. These humble beginnings are surely as hopeful as Whittle's early postulations. It was, by the way, largely due to the early references in Aviation Report that work is gathering momentum in the U.S. Similar studies are beginning in France, and in England some men are on the job full time. (*Aviation Report,* 15 November 1955)

Electro-Gravitics Effort Widening ~ Companies studying the implications of gravitics are said in a new statement, to include Glenn Martin, Convair, Sperry-Rand, Sikorsky, Bell, Lear Inc. and Clark Electronics. Other companies who have previously evinced interest include Lockheed Douglas and Hiller. The remainder are not disinterested, but have not given public support to the new science - which is widening all the time. The approach in the U.S. is in a sense more ambitious than might have been expected. The logical approach, which has been suggested by Aviation Studies, is to concentrate on improving the output of electrostatic rigs in existence that are known to be able to provide thrust. The aim would be to concentrate on electrostatics for propulsion first and widen the practical engineering to include establishment of local gravity forcelines, independent of those of the earth's, to provide unfettered vertical movement as and when the mathematics develops.

However, the U.S. approach is rather to put money into fundamental theoretical physics of gravitation in an effort first to create the local gravitation field. Working rigs would follow in the wake of the basic discoveries. Probably the correct course would be to sponsor both approaches, and it is now time that the military stepped in with big funds. The trouble about the idealistic approach to gravity is that the aircraft companies do not have the men to conduct such work. There is every expectation in any case that the companies likely to find the answers lie outside the aviation field. These would emerge as the masters of aviation in its broadest sense. The

feeling is therefore that a company like A. T. & T. is most likely to be first in this field. This giant company (unknown in the air and weapons field) has already revolutionized modern warfare with the development of the junction transistor and is expected to find the final answers to absolute vehicle levitation. This therefore is where the bulk of the sponsoring money should go. (*Aviation Report,* 9 December 1955)

Appendix II: Electrostatic Patents ~

(a) American Patents still in force:
2,413,391 ~ Radio Corp. America: Power Supply System (20-6-42/31-12-46)
2,417,452 ~ Ratheon Mfg. Co.: Electrical System (17-1-44/18-3-47)
2,506,472 ~W.B. Smits: Electrical Ignition Apparatus (3-7-46)
2,545,354 ~ G.E.C.: Generator (16-3-50/13- 3-51) (UK 676,953)
2,567,373 ~ Radio Corp. America: Electrostatic Generator (10-6-49/11- 9-51)
2,577,446 ~ Chatham Electronics: Electrostatic Voltage Generator (5-8-50/ 4-12-51)
2,578,908 ~ US-Atomic Energy Comm.: Electrostatic Voltage Generator (26-5-47/18-12-51)
2,588,513 ~ Radio Corp. America: Electrstatic High-Voltage Generator (10-6-49/11-3-52)
2,610,994 ~ Chatham Electronics: Electrostatic Voltage Generator (1-9-50/16- 9-52)
2,662,191 ~ P. Okey: Electrostatic Machine (31-7-52/8 -12-53)
2,667,615 ~ R.G. Brown:Electrostatic Generator (30-1-52/26- 1-54)
2,671,177 ~ Consolidated Engg. Corp: Electrostatic Charging Apparatus(4-9-51/2 - 3-54)
2,701,844 ~ H.R. Wasson: Electrostatic Generator (8-12-50/ 8- 2-55)
2,702,353 ~ US-Navy: Miniature Printed Circuit Electrostatic Generator (17-7-52/15- 2-55)

(b) British patents still in force:
UK651,153 ~ Metr.-Vickers Electr.Co.: Voltage Transformation of electrical energy (20-5-48/14-3-51)
UK651,295 ~ Ch.F.Warthen: Electrostatic A.C. Generator (6-8-48/14-3-51)
UK731,774 ~ Licentia: Electrostatic High-Voltage Generator (19-9-52 & 21-11-52/15- 6-55)

(c) French patents still in force:
FR 753,363 ~ H. Chaumat: Moteur electrostatique utilisant l'energie cinetique d'ions gazeux (19-7-32/13-10-33)
FR 749,832 ~ H. Chaumat: Machine electrostatique a excitation independante (24-1-32/29- 7-33)

G or A: The following patents derive from P. Jolivet (Algiers), marked "A" and from N.J. Felici, E. Gartner (Centre National des Recherches Scientifique, CRNS) later also by R. Morel, M. Point, etc. (S.A. des Machines Electrostatiques, SAMES) and of Societe' d'Appareils de Controle et d'Equipment des Moteurs (SACEM), marked "G " because the development was centred at the University Grenoble.

G (8-11-44) UK 993,017 ~ US 2,486,140 ~ FR 56,027 ~ DE 860,649 (Electrostatic Influence Machine)
G (17-11-44) UK 639,653 ~ US 2,523,688 ~ FR 993,052 ~ DE 815,667 (Electrostatic Influence Machine)
A (28-2-45) UK 912,444 (Electrostatic Machines)
G (3-3-45) UK 643,660 ~ US 2,519,554 ~ FR 995,442 ~ DE 882,586 (Electrostatic Machines)
A (8-6-45) UK 915,929 (Electrostatic Machines)
A (16-8-45) UK 918,547 (Electrostatic Generator)
G (20-9-45) UK 998,397 [?]
-- (21-9-45) UK 643,664 ~ US 2,523,689 ~ FR 837,267 (Electrostatic Machines)

A (4-2-46) FR 923,593 (Electrostatic Generator)
G (17-7-46) UK 643,579 ~ US 2,530,193 ~ FR 1,002,031 ~ DE 811,595 (Generating Machines)
G (20-2-47) UK 671,033 ~ US 2,590,168 (Ignition Device)
G (21-3-47) US 2,542,49 (Electrostatic Machines)
G (6-6-47) UK 645,916 ~ US 2,522,106 ~ FR 948,409 ~ DE 810,042 (Electrostatic Machines)
A (16-6-47) FR 947,921 [?] (Electrostatic Generator)
G (16-1-48) UK 669,645 ~ US 2,540,327 ~ FR 961,210 ~ DE 810,043 (Electrostatic Machines)
G (21-1-49) UK 669,454 ~ US 2,617,976 ~FR 997,991 ~ DE 815,666 (Electrostatic Machines)
G (7- 2-49) UK 675,649 ~ US 2,649,566 ~ FR 1,010,924 ~ DE 870,575 (Electrostatic Machines)

G (15- 4-49) UK 693,914 ~ US 2,604,502 ~ FR 1,011,902 ~ DE 832,634 (Commutators)
G (9-11-49) UK 680,178 ~ US 2,656,502 ~ FR1,004,950 ~ DE 850,485 (Electrostatic Generator)

G (9-10-50) UK 702,494 ~ US 2,675,516 ~ FR 1,030,623 (Electrostatic Generator)
G (29-11-50) UK 702,421 ~ FR 1,028,596 (Electrostatic Generator)
G (21-11-51) UK 719,687 ~ FR 1,051,430 F10421 (Electrostatic Machines)
G (20-8-52) UK 731,773 ~ US 2,702,869 ~ FR 938,198 (Electrostatic Machines)
G (6-11-52) UK 745,489 (Electrostatic Generator)
G (12-2-53) UK 745,783 (Rotating Electrostatic Machines)
G (8-1-52) UK 715,010 ~ US 2,685,654~ FR 1,047,59 (Rotating Electrostatic Machines)

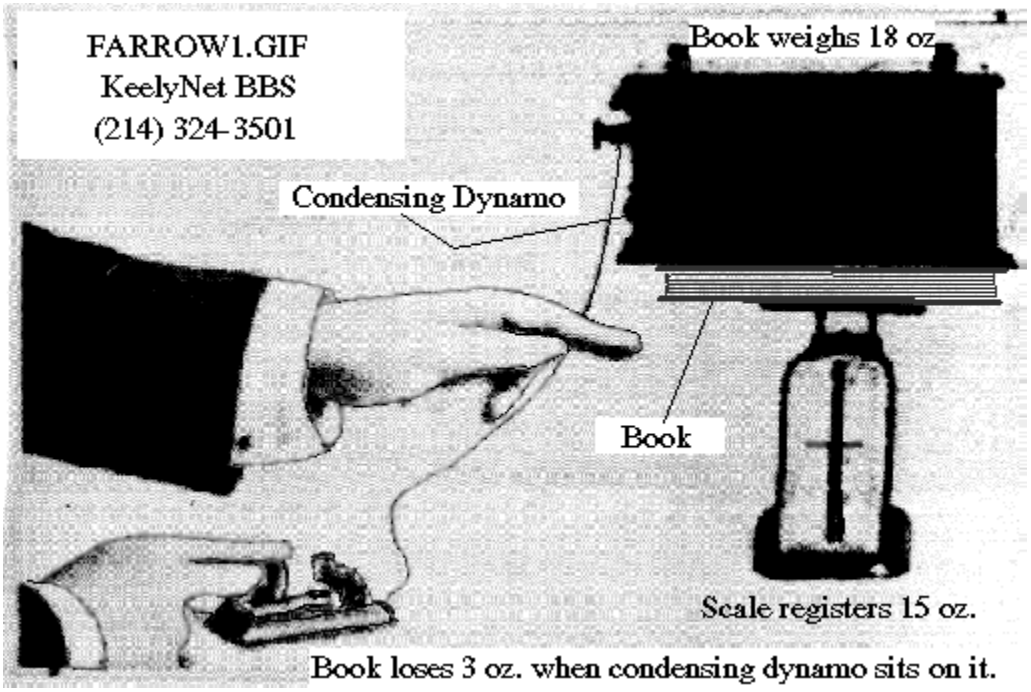
Edward FARROW Gravity Reduction

www.keelynet.com
farrow.asc (01-05-94)
Source : "Tesla Coil Secrets; Construction Notes and Novel Uses" by R. A. Ford (pages 69-71)

Reduction of Weight Using a Hertzian Wave Generator

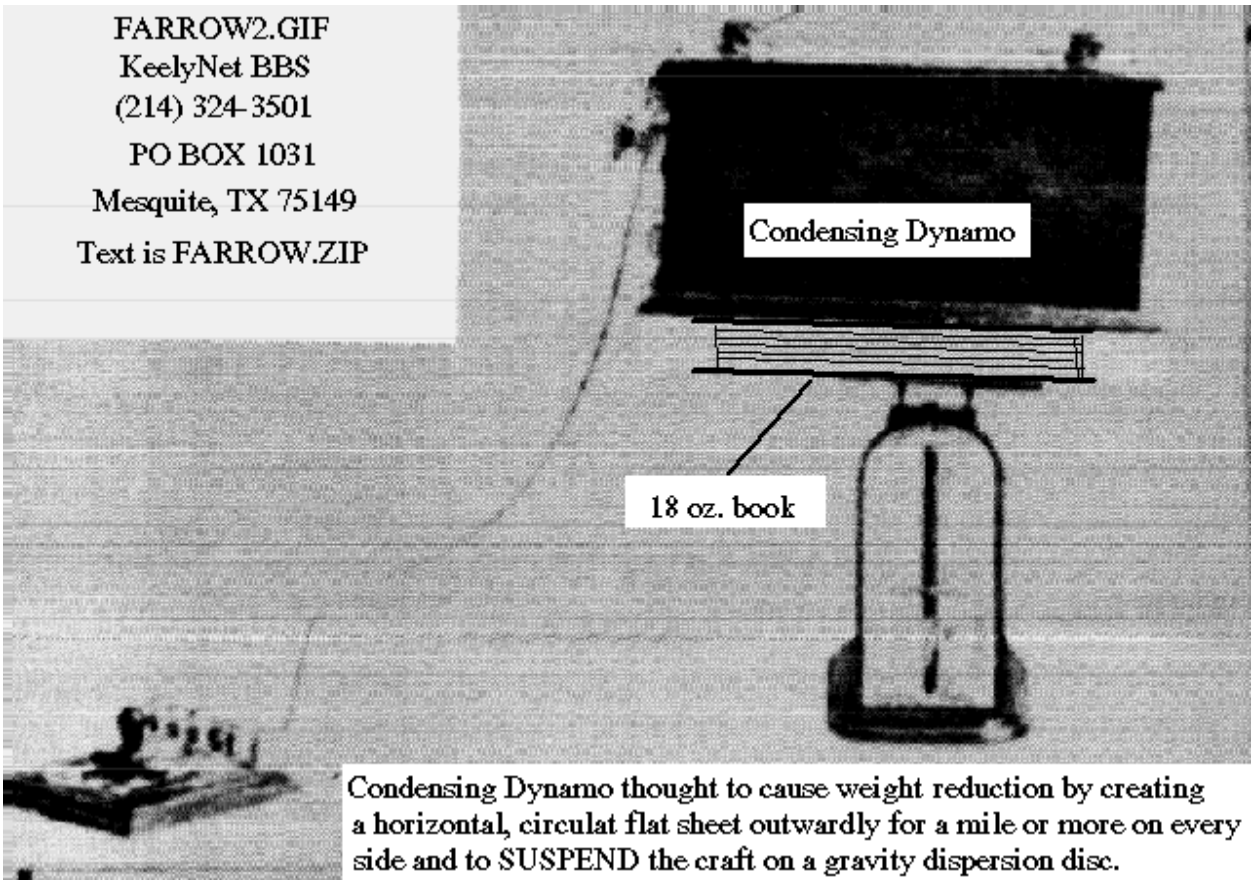
In 1911, New York engineer and inventor Edward S. Farrow publicly described his work with a "condensing dynamo". When this electrical device was placed on weight scales and power applied, the dynamo and any small weight attached to it, proceeded to lose 1/6th of its weight (3 ounces),

AS WELL AS THE (UNKNOWN) WEIGHT OF THE BOX!



Test Setup before Farrow device is energized

In the photo the total weight was 18 ounces before the power was on and it dropped down to 15 ounces while in operation.



Condensing Dynamo thought to cause weight reduction by creating a horizontal, circulat flat sheet outwardly for a mile or more on every side and to SUSPEND the craft on a gravity dispersion disc.

Weight loss when Farrow device is in operation

In Farrow's explanation, he said that the dynamo acted to "intensify the vertical component" of the Hertzian waves which it generated. This intensifaction produced buoyancy in any object to which the unit was attached. The unusual pattern of Hertzian waves fanned out in a thin horizontal plane of electromagnetic stress over a broad area. The condensing dynamo employed either a horizontal row or a ring consisting of a series of interrupters or breaks (gaps) for producing this field. The ring of electrical breaks extended in a horizontal line around the perimeter of the device. Power and frequency of the oscillators were not given. The buoyant effect is similar to that produced by floating a sewing needle on water. Although the steel has a much higher density than the water below it, the surface tension permits the linkup of many surrounding water molecules in a thin film or sheet. Similarly, the dynamo lifts against the strong gravitational field by REACTION against the weak geomagnetic field. The interaction over a very wide area between this field and the Hertzian waves produces electrical buoyancy. No U.S. patent was received on the invention. Norm Wootan tells us another version of this story from another book yet with additional information, essentially the same except for mentioning that Mr. Farrow had demonstrated his device at the 1926 World's Fair. We will pursue this angle and create another FARROW or append to this one when we get any new information. There are MANY correlations for this phenomenon, most of which use different types of force, geometry or motion. They include sonic (voice, tuning forks/bars, oscillators), spinning masses, gyroscopic precession, high voltage, etc.

Ephraim FISCHBACH, *et al.* Hypercharge -- Fifth Force

http://en.wikipedia.org/wiki/Fifth_force

Fifth Force

Occasionally, physicists have postulated the existence of a fifth force in addition to the four known fundamental forces. The force is generally believed to have roughly the strength of gravity (i.e. it is much weaker than electromagnetism or the nuclear forces) and to have a range of anywhere from less than a millimeter to cosmological scales.

The idea is difficult to test, because gravity is such a weak force: the gravitational interaction between two objects is only significant when one is very heavy. Therefore, it takes very precise equipment to measure gravitational interactions between objects that are small compared to the Earth. Nonetheless, in the late 1980s a fifth force, operating on municipal scales (i.e. with a range of about 100 meters), was reported by researchers (Fischbach et al.) who were reanalyzing results of Loránd Eötvös from earlier in the century. The force was believed to be linked with hypercharge. Over a number of years, other experiments have failed to duplicate this result, and physicists now believe that there is no evidence for a fifth force.

Theory and Experiment

There are at least three kinds of searches that can be undertaken, which depend on the kind of force being considered, and its range.

One way is to search for a fifth force with tests of the strong equivalence principle: this is one of the most powerful tests of Einstein's theory of gravity, general relativity. Alternative theories of gravity, such as Brans-Dicke theory, have a fifth force — possibly with infinite range. This is because gravitational interactions, in theories other than general relativity, have degrees of freedom other than the "metric," which dictates the curvature of space, and different kinds of degrees of freedom produce different effects. For example, a scalar field cannot produce the bending of light rays. The fifth force would manifest itself in an effect on solar system orbits, called the Nordtvedt effect. This is tested with Lunar Laser Ranging Experiment and very long baseline interferometry.

Another kind of fifth force, which arises in Kaluza-Klein theory, where the universe has extra dimensions, or in supergravity or string theory is the Yukawa force, which is transmitted by a light scalar field (i.e. a scalar field with a long Compton wavelength, which determines the range). This has prompted a lot of recent interest, as a theory of supersymmetric large extra dimensions — dimensions with size slightly less than a millimeter — has prompted an experimental effort to test gravity on these very small scales. This requires extremely sensitive experiments which search for a deviation from the inverse square law of gravity over a range of distances. Essentially, they are looking for signs that the Yukawa interaction is kicking in at a certain length.

Australian researchers, attempting to measure the gravitational constant deep in a mine shaft, found a discrepancy between the predicted and measured value, with the measured value being two percent too small. They concluded that the results may be explained by a repulsive fifth force with a range from a few centimetres to a kilometre. Similar experiments have been carried out onboard a submarine (USS Dolphin (AGSS-555)) while deeply submerged.

The above experiments search for a fifth force that is, like gravity, independent of the composition of an object, so all objects experience the force in proportion to their masses. Forces that depend on the composition of an object can be very sensitively tested by torsion balance experiments of a type invented by Loránd Eötvös. Such forces may depend, for example, on the ratio of protons to neutrons in an atomic nucleus, or the relative amount of different kinds of binding energy in a nucleus (see the semi-empirical mass formula). Searches have been done from very short ranges, to municipal scales, to the scale of the Earth, the sun, and dark matter at the center of the galaxy.

Other Interactions

A few physicists think that Einstein's theory of gravity will have to be modified, not at small scales, but at large distances, or, equivalently, small accelerations. They point out that dark matter, dark energy and even the Pioneer anomaly are unexplained by the Standard Model of particle physics and suggest that some modification of gravity, possibly arising from Modified Newtonian Dynamics or the holographic principle. This is fundamentally different from conventional ideas of a fifth force, as it grows stronger relative to gravity at longer distances. Most physicists, however, think that dark matter and dark energy are not ad hoc, but are supported by a large number of complementary observations and described by a very simple model.

References

Ephraim Fischbach, Daniel Sudarsky, Aaron Szafer, Carrick Talmadge, and S. H. Aronson, "Reanalysis of the Eötvös experiment", Physical Review Letters 56 3 (1986).
University of Washington Eöt-Wash group, the leading group searching for a fifth force.
Lunar Laser Ranging [1]
Satellite Energy Exchange (SEE) [2], which is set to test for a fifth force in space, where it is possible to achieve greater sensitivity.

---

http://www-tech.mit.edu/V105/N58/force.58n.html
***The Tech Online* -- Volume 105, Issue 58 (January 22, 1986)**

Physicists Discover Fifth Force

By

David P. Hamilton

Physicists at Purdue University believe they have discovered a fifth elementary force of nature. This postulated force, named hypercharge, may oppose the force of gravity.

Dr. Ephraim Fischbach and his colleagues have reinterpreted the results of the experiments of Roland von Eotv"os, a Hungarian scientist of the early 20th century. Eotvos' work involved a test of the principle of equivalence, an Einsteinian postulate stating that gravity affects objects independently of their composition. Eotv"os found a small but systematic error in his calculations and declared a null experiment.

The principle of equivalence is one of the fundamental assumptions of Einstein's General Theory of Relativity. Even the verification of hypercharge is unlikely to seriously affect the principle, according to Peter Saulsan, a principle research scientist for the MIT Department of Physics.

Fischbach declared in the Jan. 6 issue of Physical Review Letters that Eotvos' error is systematic enough to prove the existence of an ephemeral force opposed to that of gravity.

Saulson said that Fischbach had found an "astoundingly good" correlation between the degree of the error and the baryon number of the tested materials. The baryon number of a material is equal to the total number of protons and neutrons in its nucleus.

The extremely localized effect of the hypercharge force would not significantly damage the theory of relativity, Saulsan said.

The principal differences between hypercharge and gravity appear to lie in the forces' effective range and strength, Saulsan said.

Unlike gravity, whose effects seem to extend to an infinite distance, hypercharge appears to have a finite range of approximately 200 meters, he continued.

Two other elementary forces, the strong and weak nuclear forces, also have finite ranges, although the range of these forces is more on the order of the diameter of the atomic nucleus, Saulsan said.

Fischbach also quoted the results of more recent experiments which seem to support the existence of hypercharge, Saulsan said.

Experiments conducted as far as one kilometer underground by Frank D. Stacey of the University of Queensland in Australia indicate that the force of gravity varies by as much as seven-tenths of one percent at different depths in the earth.

Other scientists have reported the apparent effects of another elementary force in experiments conducted at the Fermi National Accelerator Laboratory in Batavia, Illinois, according to a Jan. 8 article in the New York Times.

The theory of hypercharge could still face some problems, Saulsan claimed. For instance, Eotvos' "systematic trend" of error is greater than Stacey's reported gravitometric anomaly by a factor of more than 20.

Reasonable explanations for this disagreement exist, Saulsan suggested. He elaborated on the difficulty of Eotvos' original experiment, which involved the use of a torsion balance which would respond to gravity while taking the rotation of the earth into account.

Interpreting data from a 60-year-old experiment is also rather difficult, Saulsan said. In addition, Stacey's work required him to estimate the density of the rock above him as he conducted his experiments. These estimates could easily have been in error, he continued.

Four elementary forces have already been identified. In order from weakest to strongest, they are: gravity, electromagnetic, the weak nuclear force, and the strong nuclear force. Scientists believe that these forces can explain any phenomenon, including the creation of the universe.

If hypercharge actually does exist, it would be a step away from physicists' attempts to mathematically unify the elementary forces of nature, Saulsan said. But widespread acceptance of the theory would not threaten any physicist's "dearly-cherished notions," he added.

The theory would still be a "first-rate" discovery if verified, Saulsan said.

---

http://www.time.com/time/magazine/article/0,9171,1074978,00.html
Tuesday, Jun. 21, 2005

A Fifth Force?

In the famous anecdote, Galileo Galilei clambered to the top of the Leaning Tower of Pisa, simultaneously dropped cannonballs of different sizes and found that they all hit the ground at

the same time. He thus convinced the world -- and in the years to come, Sir Isaac Newton and Albert Einstein as well -- that in a vacuum all objects, regardless of mass, fall at the same speed. Galileo's work went unchallenged until last week, when Purdue University Physics Professor Ephraim Fischbach, three of his graduate students and S.H. Aronson, a physicist at Brookhaven National Laboratory in New York, reported discerning a previously unknown force that causes objects of different masses to fall at different rates.

If Fischbach is proved right, his hypothetical force, which he calls hypercharge, would be the fifth known basic force. (Four forces are known to exist: gravity; electromagnetism; the strong force, which binds the atomic nucleus; and the weak force, which is responsible for certain types of radioactivity.) Hypercharge, Fischbach reports in Physical Review Letters, is an extremely weak repulsive force that acts between objects no more than about 600 feet apart and varies in strength from element to element. It is strongest in iron and weakest in hydrogen. Thus, the physicists contend, if an iron ball and, say, a feather were released simultaneously in a vacuum, the iron's repulsive hypercharge would act more strongly than the feather's to counteract the earth's gravity--and the feather would hit first.

The team began looking for evidence of hypercharge after perceiving what Fischbach calls "funny results" in two contemporary experiments, one involving gravity tests in a deep mine, the other the behavior of subatomic particles. "We felt the results could be explained with an additional force," says Fischbach, "so we went back to the data published by Baron Roland von Eötvös in Hungary in 1922 to see if we could find evidence." Eötvös had indirectly measured the speeds at which objects fall and found small discrepancies, which he attributed to limitations in his equipment. Re-examining the data, the team decided that the aberrations were caused by hypercharge. But other physicists caution that more experiments are necessary before a firm conclusion can be reached. Says Harvard University's Sheldon Glashow: "The work suggests an interesting direction, but by no means should be taken as a real discovery."

---

http://prola.aps.org/abstract/PRL/v56/i22/p2347_1
***Phys. Rev. Lett.* 56, 2347 - 2349 (1986)**

Hypercharge Fields and Eötvös-Type Experiments

P. Thieberger
Department of Physics, Brookhaven National Laboratory, Upton, New York 11973

It is shown that Eötvös-type torsion-balance experiments performed in the vicinity of a large cliff may be used as sensitive tests for the recently postulated existence of a medium-range hypercharge force. The residual nonzero effect found in the original Eötvös results could be mainly due to terrain irregularities and thus be larger than, but still correlated to, the effects expected from the Earth's rotation and the hypercharge hypothesis.

---

http://prola.aps.org/abstract/PRL/v56/i1/p3_1
***Phys. Rev. Lett.* 56, 3 - 6 (1986)**

Reanalysis of the Eoumltvös experiment

Ephraim Fischbach
Institute for Nuclear Theory, Department of Physics, University of Washington, Seattle, Washington 98195

Daniel Sudarsky, Aaron Szafer, and Carrick Talmadge
Physics Department, Purdue University, West Lafayette, Indiana 47907

S. H. Aronson
Physics Department, Brookhaven National Laboratory, Upton, New York 11973

We have carefully reexamined the results of the experiment of Eötvös, Pekár, and Fekete, which compared the accelerations of various materials to the Earth. We find that the Eötvös-Pekár-Fekete data are sensitive to the composition of the materials used, and that their results support the existence of an intermediate-range coupling to baryon number or hypercharge.

---

http://www.npl.washington.edu/av/altvw15.html

Antigravity II: A Fifth Force?

by

John G. Cramer

Sometimes physics moves surprisingly fast, sometimes dismayingly slowly. In mid-December I wrote my AV column (Analog, 7/86) on antigravity, a familiar SF concept. That column was based on a 1957 paper by Bondi on negative mass. Almost nothing had been published on gravitational repulsion in the almost 30 years since the appearance of Bondi's paper. The scientific "field" of antigravity research was essentially non-existent.

Then, as soon as my column was safely submitted, hot new results on antigravity appeared. The lead article in the January 6, 1986 issue of Physical Review Letters had the unassuming title: "A Reanalysis of the Eötvös Experiment" by E. Fischbach, et al. Two days later the New York Times ran an article with the headline: "Hints of Fifth Force in Universe Challenge Galileo's Findings" describing the importance of Fischbach's work. Peculiar experimental results from terrestrial gravity measurements and from the behavior of "strange" K-mesons (kaons) had been explained by a new theory proposing a "hypercharge" force, a new fifth force of nature which is gravity-like but which repels rather than attracting nearby masses. This new antigravity force is the subject of this AV column.

The first thread of this story goes back two centuries to Sir Isaac Newton. Newton discovered the famous gravitational "inverse square-law" relation, F12 = Gm1m2/r2, which proved equally useful in predicting the orbit of the Moon and the force of gravity at the surface of the Earth. In Newton's equation G is a fundamental quantity called the universal gravitational constant. Among the physical constants of nature, G stands out as being the most uncertain. Fundamental constants (the velocity of light, the electron charge) are usually known to a few parts per million, but G, with a value of 6.673 × 10-11 m3/kg-s2, is known to only about 1 part in 2000.

In a way, it is surprising that G is so poorly known. The orbits of planets in our solar system depend directly on G and are both observed and calculated to parts per billion. The problem is that to obtain G from these data we must have a completely independent knowledge of the masses involved in the gravitational attraction. Unfortunately, we have no way, independent of orbital dynamics, of measuring the masses of the Earth, Moon, Sun, Jupiter, etc. Therefore, our imprecise knowledge of G must come from the very weak force of gravitational attraction observed in the laboratory between two masses, for example two large lead spheres placed close together.

But there is another way of measuring G. The oil industry has developed extremely precise devices for measuring g, the acceleration due to gravity, both on and beneath the Earth's surface.

The dependence of the acceleration g on depth can be used to determine the gravity constant G. When the densities of the rock strata have been well mapped, this determination has an accuracy comparable to laboratory measurements of G. One would expect both methods to give the same value of the "constant". It is a big surprise, therefore, that the geological technique gives a value of 6.734 × 10-11 m3/kg-s2 (instead of 6.673 × 10-11). It would appear that this "universal constant" has significantly different values below the Earth's surface and in a surface laboratory.

The second thread of the story comes from modern particle physics. The species of particles called K-mesons or kaons are unusual among mesons in having a characteristic called hypercharge, a conserved property of certain particles. The neutral "matter" kaon is the Ko theoretically a system composed of a "down" quark and an "anti-strange" quark, has a hypercharge of +1. Its antimatter twin, the Kõ, a strange quark and an anti-down quark, has a hypercharge of -1. Both Ko's have the same electrical charge (Q=0), the same spin (s=0), and the same mass (about half that of a proton). From all external clues these two theoretical particles are indistinguishable except in their hypercharge, which is not directly observable.

In this situation where two states of matter cannot be distinguished externally, quantum mechanics tells us that a very interesting thing happens. The two indistinguishable states are "mixed" to make two new states of matter which are distinguishable. This mixing produces from the combination (Ko-Kõ) the particle KS which decays in about 10-10 seconds (and so is called K-short). And it produces from the combination (Ko+ Kõ) the particle KL which decays 581 times more slowly (and therefore is called K-long). The KL particle has been found to be very peculiar in its decay into other particles, showing a favoritism for one direction of time over another and for matter over antimatter. These violations of symmetry principles of nature (time-reversal and charge invariance) are not understood in any fundamental way.

But more recently another peculiarity of the kaon system has been discovered which is even more of a puzzle. Detailed studies of the KL and KS mesons have been made at a number of accelerator laboratories under a variety of experimental circumstances. When these experiments are reduced to the few basic "constants" of the kaon system, for example the KL-KS mass difference and the KS half-life, these "constants" are found to depend on the velocity of the kaons with respect to the laboratory frame of reference. This is not a special relativity effect; those are already included in the data analysis. In fact, this velocity dependence cannot be readily accounted for by any of the four known forces or by any known physical effects.

Prof. Ephriam Fischbach and his colleagues, in the paper mentioned above, have sought to explain both of these curious results, the variation of G and the velocity dependence of the kaon system, with a single theory. They start with the fact that kaons, neutrons, and protons all have hypercharge. Perhaps, the paper speculates, there is new and very weak force associated with hypercharge which is responsible for the anomalies in both the gravitational and the kaon measurements. Starting from this point, they calculate the properties which such a "fifth" force must have to be consistent with these observations. They conclude that this new force would be very much like gravity, but with four important differences: (1) it depends on hypercharge rather than mass; (2) it is a repulsive force, in that objects with the same hypercharge are repelled from each other; (3) it has a strength only 0.7% that of gravity; and (4) it is a "short range" force which cuts off exponentially at distances on the order of 200 meters.

This last point requires some explanation. Two of the four known forces of nature, gravity and electromagnetism, are "long range" forces which fall off as 1/r2 with the distance from a massive or charged object but otherwise extend to infinity. The other two known forces, the weak and strong interactions, are "short range" and cut off to zero at distances on the order of the size of a

nucleus. These differences in range are attributed to the masses of the "mediating particles" which produce the forces. Electromagnetism is mediated by the photon and gravity by the graviton, both particles with zero rest-mass which give their corresponding forces infinite range. The strong interaction is mediated by the gluon and the weak interaction by the Z and W particles, all of which have masses on the order of that of the proton and give their corresponding forces very short ranges. According to the "fifth force" hypothesis, the range of the force which would account for the G measurements and the kaon anomalies would have to be about 200 meters. This corresponds to a very light mediating particle (the "hyper-photon") with a mass about 10-14 that of the electron.

This hypothesis can explain the G difference. Gravitating objects within a few hundred meters of each other, for example, the lead spheres in a laboratory measurement of G, feel a 0.7% repulsion from the hypercharge force which reduces the attraction slightly and leads to a slightly low measured value for G. The geological measurements of g, however, record the gravitational attraction of masses which are typically much more distant than a few hundred meters and give a value of G unmodified by hypercharge repulsion.

The hypothesis can also explain the kaon energy dependence. The Ko and Kõ, with opposite hypercharges, are mixed in slightly different proportions at different velocities because the extra hypercharge force from the nearby neutrons and protons of nuclei in the laboratory acts oppositely on them. Thus their invariant properties become variables. The "true" properties of the kaons, according to the hypercharge theory, would be obtained if measurements were made in empty space with no hypercharge field from nearby matter to modify the Ko+ Kõ mixing.

Like any theory, this one need testing. And one "test" has already been done and seems to agree with the predictions of the theory. This test was not a new experiment but a re-analysis of the Eötvös Experiment, the famous experimental comparison of inertial and gravitational mass performed by a Hungarian count in the early decades of this century and published only after his death in 1922. Fischbach and his collaborators realized that Eötvös should have seen some evidence for the hypercharge force. The reason is that the hypercharge of a nucleus depends strictly on the number of neutrons and protons in the nucleus, while the mass of a nucleus depends also on the binding energy of the system. Thus an iron nucleus with large binding energy has a larger hypercharge-to-mass ratio than does a hydrogen nucleus. To put it another way, a kilogram sphere of water contains fewer neutrons and protons and has a smaller hypercharge than a kilogram sphere of iron. Therefore the sphere of water should fall slightly faster in vacuum than the iron sphere because there would be a smaller hypercharge force acting on the water than on the iron. The Eötvös experiment should have shown the effects of these small modifications of the force of gravity. And Fischbach's re-examination of the Eötvös data reveals that indeed the predicted effect does seem to be present in the old data.

This new theory has had its first experimental confirmation. Much more work in testing for the hypercharge force needs to be done, of course, before it can be considered as established. This is a "hot" topic and many experimental groups, including one in my own laboratory, are swinging into action to do the testing.

But in the nature of this column, let's assume for the moment that the hypercharge force is real and consider its science fiction implications. First, by damn, we have antigravity! But no dancing in the streets just yet, please! For use in the "normal" antigravity way in science fiction, the hypercharge force does have a few problems: (1) it's too weak, and (2) it only works over a few hundred meters of distance. So we need some hypercharge "amplifier", some way for getting more hypercharge without getting more mass. That might be possible if there were massless

particles (maybe hyper-photons or neutrinos), that had hypercharge without having a proton-size mass, but none-such are known. Or perhaps there are "hyper-magnetic" effects when a hypercharged object is moved at a goodly velocity.

Anyhow, suppose we can overcome this obstacle and produce vehicles using hyper-repulsion. How might they work? Well, first of all the range is a problem. At 600 meters above the ground, the range effect will cut down the hyper-repulsion to only 5% of what it is at the surface. So the vehicle would be most effective at distances of 50 meters or less above the surface. It would resemble the "floaters" and "grav sleds" which are common SF techno-props, but it would not be directly useful in space travel or propulsion.

It's worth considering also that in the process of repelling the ground, the hyper-force on our hypothetical floater would also tend to repel the passengers. This unpleasant side effect might be avoided by placing the repulsion sources for minimum effect on the passengers, perhaps at many points which lie on the same spherical surface. But passenger-repulsion might also be turned into an advantage by using it to reduce or nullify the forces of acceleration. With a suitable hyperfield system high-performance spacecraft or aircraft might might, by balancing inertial forces with hyper-repulsion, be able to accelerate at many g's without squashing pilot and passengers. Free-fall space habitats might produce simulated gravity with hyperfield units mounted in the ceilings, with hyper-repulsion pushing the occupants toward the floor.

Anyhow, stay tuned to this column for further developments on the hypercharge force. The definitive tests of the theory will be well in progress by the time you read this column.

REFERENCES:

G Measurement Anomaly:
S. C. Holding and G. J. Tuck, Nature 307, 714 (1984).

Kaon Anomaly:
S. H. Aronson, G. J. Bock, H. Y. Cheng, and E. Fischbach, Physical Review D28, 476 (1983).

Fifth Force Theory:
E. Fischbach, D. Sudarsky, A. Szafer, C. Talmage, and S. H. Aronson, Physical Review Letters 56, 3 (1986).

Eötvös Experiment:
R. von Eötvös, D. Pekár, and E. Fekete, Ann. Phys. (Leipzig) 68, 11 (1922).

---

http://findarticles.com/p/articles/mi_m1200/is_/ai_4101363

Was a fifth force felt? - Hypercharge or Baryon Number Theory

Dietrick E. Thomsen

Was a fifth force felt?

Physicists have divided all the motions in the universe into the domains of four kinds of force: gravity, electromagnetism, the weak subatomic force and the strong subatomic force or color force. Each of these has its source in a different property of material objects --for example, the source of gravity is mass, while that of electromagnetic forces is electric charge. Now, a fifth force is suggested.

Such proposals tend to arise from experimental anomalies that suggest an unknown force may be acting. In the Jan. 6 PHYSICAL REVIEW LETTERS, Ephraim Fischbach (temporarily at the University of Washington in Seattle), Daniel Sudarsky, Aaron Szafer and Carrick Talmadge of

Purdue University in West Lafayette, Ind., and S. H. Aronson of Brookhaven National Laboratory in Upton, N.Y., propose that a fifth force was operating in a famous experiment done in Hungary in 1922 by Roland von Eotvos, D. Pekar and E. Fekete. The Eotvos experiment, as it is called, tested the law of gravity by measuring the gravitational attraction between the earth and various materials, including metals, woods and even grease or suet. Fischbach and his co-workers suggest that, unbeknownst to Eotvos and colleagues, slight differences in the responses of different materials indicate that in addition to gravity, a small, repulsive force was acting.

Fischbach and his co-workers relate this suggested force to a quality of matter called phpercharge or baryon number. The baryon number is related to the number of neutrons and protons, and therefore to the chemical composition of a material--thus explaining the difference in force for different materials. The researchers propose a formal similarity between this hypercharge force and electromagnetism. Just as electromagnetic forces are carried from object to object by intermediary particles called photons, so this hypercharge force would be carried by "hyperphotons.' A number of experiments could test for the existence of the hypercharge force, including a direct search for the hyperphotons themselves.

---

http://www.springerlink.com/content/p7n48n030x28l66g/
***Astrophysics and Space Science*, Volume 126, Number 2 / October, 1986**

A Scalar-Tensor Theory and the New Interaction

Luis O. Pimentel and Octavio Obregón

[Department of Physics, Universidad Autónoma Metropolitana-Iztapalapa, P.O. Box 55-534, CP 09340 Mexico, D.F., Mexico]

Abstract --- We present a scalar-tensor theory whose weak field limit gives exactly the potential proposed by Fischbach et al. (1986). The three experimental constants G infin, agr, and lambda are related to three parameters in our theory. At the level of the theory we have obtained the field produced by a source. The way this field should couple with a massive and lsquochargedrsquo particle (baryonic hypercharge) is a matter beyond the scope of this work.

---

http://www.amazon.com/gp/reader/0387984909/ref=sib_dp_pt#reader-link

The Search for Non-Newtonian Gravity

by

Ephraim Fischbach & Carrick L. Talmadge

Newton's inverse-square law of gravitation has been one of the cornerstones of physics ever since it was proposed 300 years ago. One of its most well known features is the prediction that all objects fall in a gravitational field with the same acceleration. This observation, in the form of the Equivalence Principle, is a fundamental assumption of Einstein's General Relativity Theory. This book traces the history of attempts to test the predictions of Newtonian Gravity, and describes in detail recent experimental efforts to verify both the inverse-square law and the Equivalence Principle. Interest in these questions have increased in recent years, as it has become recognized that deviations from Newtonian gravity could be a signal for a new fundamental force in nature. This is the first book devoted entirely to this subject, and will be useful to both graduate students and researchers interested in this field. This book describes in detail the ideas that underlie searches for deviations from the predictions of Newtonian gravity, focusing on

macroscopic tests, since the question of gravitational effects in quantum systems would warrant a separate work. A historical development is combined with detailed technical discussions of the theoretical ideas and experimental results. A comprehensive bibliography with approximately 450 entries is provided.

---

http://www.time.com/time/magazine/article/0,9171,968137,00.html
Monday, Aug. 15, 1988

Was Sir Isaac All Wet?

By John Langone

As every physics student learns, there are four known forces of nature: gravity, electromagnetism, a "strong" force that binds atomic nuclei and a "weak" one that governs certain types of radioactive decay. Last week researchers at the Los Alamos National Laboratory announced that they may have found the best evidence yet for a hypothetical, elusive "fifth force." If confirmed, their findings could mean that Sir Isaac Newton's famous inverse- square law of gravity* is in danger of losing the exalted position it has held for three centuries. "It's like saying Mom and apple pie's no good anymore," admits the leader of the gravity project, Geophysicist Mark Ander. "You just don't do that lightly."

The physicists reached their conclusion as the result of an experiment conducted in Greenland last summer. They lowered a supersensitive gravity meter into a mile-deep hole bored in glacial ice -- chosen because its density is more uniform than that of rock -- and monitored the gravitational pull as the meter descended. What occurred was startling: the expected increase in gravitational force predicted by Newton was there, but it got stronger faster than expected. Either something was enhancing the force of gravity or the researchers had come upon a heretofore unknown, far more complex working of gravity itself. Or, just possibly, they had made a mistake.

The fifth force, if that is what it is, has been a source of debate among physicists since its existence was suggested in 1981 by Australian mineshaft experiments. Five years later, Purdue University Physics Professor Ephraim Fischbach measured a weak force he called "hypercharge" and theorized that it caused objects of different composition to fall at different rates. Since Fischbach's finding, as many as 45 experiments have sprung up in search of the mystery force, and so far each has served only to confound rather than clarify the issue.

In some, for example, gravity appears to be enhanced, while in others it seems to be counteracted. Moreover, findings from a U.S. Air Force gravity study were even interpreted by some scientists as evidence of a "sixth force." But if the existence of an additional force was proved, scientists would have to readjust their calculations of gravitational force. "It's like something completely out of left field," notes Los Alamos Physicist Terry Goldman. "You don't know quite what to do with it."

Jim Thomas, a physicist at the California Institute of Technology, praises the technical precision of Ander's experiment, but cautions that measuring gravity in holes is inexact at best. He points out, for example, that an aberration in the earth's crust might have caused the unusual measurements. "What we're really talking about is the possible modification of gravity, which is the fourth force," adds Thomas. Even Ander stresses that rigorous confirmation is needed before he accepts the results of his Greenland experiment. Says he: "You keep saying to yourself, 'Gee, I've gotta be wrong -- Newton certainly can't be wrong.' "

FOOTNOTE: *Newton's law holds that gravitational pull increases in inverse proportion to the square of the distance between two bodies.

Energy Citations Database
http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=5972961
(1986 Mar 31)

Experimental signals for hyperphotons

Aronson, S.H. ; Cheng, H. ; Fischbach, E. ; Haxton, W.

We discuss experiments for detecting hyperphotons (..gamma../sub Y/), which are the real quanta of a hypercharge field whose existence has been suggested by a recent reanalysis of the Eoetvoes experiment.^It is shown that ..gamma../sub Y/ is best detected as an unobserved neutral in the decays K/sup + -/..--> pi../sup + -/..gamma../sub Y/ and K/sub S//sup 0/..--> pi../sup 0/..gamma../sub Y/, and that existing experimental limits provide nontrivial constraints on the strength and range of possible hypercharge couplings.

Google Search Results

(First several pages)

Physicists discover fifth force - The Tech
Fischbach also quoted the results of more recent experiments which seem to support the existence of hypercharge, Saulsan said. ...
www-tech.mit.edu/V105/N58/force.58n.html

A Fifth Force? - TIME
Hypercharge, Fischbach reports in Physical Review Letters, is an extremely weak repulsive force that acts between objects no more than about 600 feet apart ...
www.time.com/time/magazine/article/0,9171,1074978,00.html?iid=chix-sphere

Phys. Rev. Lett. 56, 2347 (1986): Thieberger - Hypercharge Fields ...
C. Talmadge, S. H. Aronson, and E. Fischbach, University of Washington Report No. ...
PHYSICAL REVIEW LETTERS Hypercharge Fields and Eotvos-Type Experiments ...
link.aps.org/doi/10.1103/PhysRevLett.56.2347

Phys. Rev. Lett. 56, 3 (1986): Fischbach et al. - Reanalysis of ...
S. H. Aronson, G. J. Bock, H. Y. Cheng and E. Fischbach, Phys. ..... Finally, if we take seriously the existence of a hypercharge field, then one can search ...
link.aps.org/doi/10.1103/PhysRevLett.56.3

Alternate View Column AV-15
Fischbach and his collaborators realized that Eötvös should have seen some evidence for the hypercharge force. The reason is that the hypercharge of a ...
www.npl.washington.edu/av/altvw15.html

Was a fifth force felt? - hypercharge or baryon number theory ...
hypercharge or baryon number theory from Science News in Reference provided ... Fischbach and his co-workers relate this suggested force to a quality of ...
findarticles.com/p/articles/mi_m1200/is_/ai_4101363

A scalar-tensor theory and the new interaction
reproduces exactly the potential proposed by Fischbach etal. ... should couple with a test particle

of a specific baryonic hypercharge and mass is the ...
www.springerlink.com/index/P7N48N030X28L66G.pdf

Hypercharge, solar structure, and stellar evolution
Comparison of standard and two hypercharge models with differ- ent a. The larger a corresponds to the 3 ~ limit given by Fischbach et al. 1986. ...
adsabs.harvard.edu/full/1987ApJ...313..429G

Is There a Fifth Force in Nature? Research Struggles Toward an ...
As Dr. Fischbach said, "we guessed" that the property responsible for the negative force on gravity was hypercharge. Hypercharge is the energy effect of ...
query.nytimes.com/gst/fullpage.html?
res=9B0DE7DF1F3FF935A35753C1A961948260&sec=&spon=&pagewan...

Was a fifth force felt? - Free Online Library
(hypercharge or baryon number theory) by "Science News"; Science and technology, ... Fischbach (temporarily at the University of Washington in Seattle), ...
www.thefreelibrary.com/Was+a+fifth+force+felt%3F-a04101363

Amazon.com: The Search for Non-Newtonian Gravity (AIP-Press ...
... new macroscopic forces, composition dipole, hypercharge field, terrain bias, ... My laboratory is awaiting with expectation for next book by Fischbach! ...
www.amazon.com/Search-Non-Newtonian-Gravity-AIP-Press/dp/0387984909

Gravitational Experiments in the Laboratory - Google Books Result
by Y. T. Chen, Alan Cook - 1993 - Science - 282 pages ... of l0~1n ms~2 (see Speake & Gillies, l987) and so. prompted by the search for the new hypercharge force predicted by Fischbach et al. (l986). ...
books.google.com/books?isbn=0521391717...

Was a fifth force felt? (hypercharge or baryon number theory ...
(hypercharge or baryon number theory) - From the HighBeam Research Archive. ... 6 PHYSICAL REVIEW LETTERS, Ephraim Fischbach (temporarily at the University ...
www.highbeam.com/doc/1G1-4101363.html

Universality of Free Fall and General Relativity
Fischbach's Fifth Force, and reinterpreted EPF experiments ..... with a range of hundreds of. meters, and its source was. barion number or hypercharge. ...
www.kfki.hu/eotvos/UFFEotvos4.pdf

Interact on KeelyNet Mail List: Re: The force of gravity is the ...
Fischbach and his collaborators realized that Eötvös should have seen some evidence for the hypercharge force. The reason is that the ...
keelynet.com/interact/archive/00001073.htm

Was Sir Isaac All Wet? - TIME
Five years later, Purdue University Physics Professor Ephraim Fischbach measured a weak force he called "hypercharge" and theorized that it caused objects ...
www.time.com/time/magazine/article/0,9171,968137,00.html

arXiv:hep-ph/9606249 v1 5 Jun 1996
that motion of a kaon beam perpendicular to a source of a hypercharge field can induce an .... S.H. Aronson, G.J. Bock, H.Y. Cheng and E. Fischbach, Phys. ...
arxiv.org/pdf/hep-ph/9606249

Detecting the Lorentz force of hyperphotons
We let a sphere, homogeneously filled by the hypercharge,. rotate at high speed. ... where ml and m are baryon masses, and a was estimated by Fischbach and ...
www.springerlink.com/index/F52V2G234882Q017.pdf

On the Search for an Intermediate-Range Modification of the ...
FISCHBACH. et. al. [41 claim to have found a composition dependence to the ... hypercharge or baryon number characterized by the potential energy expression ...
www.iop.org/EJ/article/0295-5075/3/1/001/epl_3_1_001.pdf

JSTOR: The Rise and Fall of the Fifth Force: Discovery, Pursuit ...
... for a given substance, pro- portional to baryon number (or hypercharge). 355 ... and Fischbach and col- leagues claimed that Eotv6s's old data itself, ...
links.jstor.org/sici?sici=0021-1753(199506)86%3A2%3C355%3ATRAFOT%3E2.0.CO%3B2-2

INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS
G for purely leptonic decays, G cosO G for the hypercharge-conserving ..... E. Fischbach, F. Iachello, A. Lande, M.M. Nieto and C.K. Scott,. Phys. Rev. ...
streaming.ictp.trieste.it/preprints/P/72/066.pdf

Hypercharge fields and Eotvos-type experiments. Authors: Thieberger, P. ... data predictions and the hypercharge hypothesis (Fischbach et al., 1986). ...
adsabs.harvard.edu/abs/1986PhRvL..56.2347T

SPIRES-HEP: FIND DK POSTULATED PARTICLE,HYPERPHOTON
13) About The Eotvos Experiment And The Hypercharge Theory. ... Hai-Yang Cheng (Indiana U.) , Ephraim Fischbach, Wick Haxton (Washington U., Seattle) . ...
usparc.ihep.su/spires/find/hep/www?dk=POSTULATED+PARTICLE,HYPERPHOTON

Fifth force - Wikipedia, the free encyclopedia
The force was believed to be linked with hypercharge. ... Ephraim Fischbach, Daniel Sudarsky, Aaron Szafer, Carrick Talmadge, and S. H. Aronson, ...
en.wikipedia.org/wiki/Fifth_force

Energy Citations Database (ECD) - - Document #5972961
sub Y/), which are the real quanta of a hypercharge field whose existence has been suggested by a recent reanalysis of the Eoetvoes experiment. ...
www.osti.gov/energycitations/product.biblio.jsp?osti_id=5972961

The Tom Bearden Website
Actually a fifth force of nature due to hypercharge may have been found by these experiments. See Ephraim Fischbach et al. "Reanalysis of the Eotvos ...
www.bibliotecapleyades.net/bearden/ferdelance/additionalnotes.htm

Topics: Fifth Force
... + S sin of baryon number and strangeness (hypercharge seems antiquated). ... but it became famous with the reanalysis of the Eötvös data by Fischbach et ...
www.phy.olemiss.edu/~luca/Topics/f/fifth.html - 6k - Cached - Similar pages

Hep Structure About Hep Structure | Search | Help black hole ...
By Talmadge, Carrick Aronson, S. H. Fischbach, Ephraim Published in ... 11) ABOUT THE EOTVOS EXPERIMENT AND THE HYPERCHARGE THEORY By Elizalde, E.
hepstructure.inr.ac.ru/hep-bin/findcits2.py?key1=16850583&skip=0

Indeed, Fischbach and coworkers pointed out that Eöt-. vös' data left room for a "gravity-like" short range fifth. force, determined by hypercharge and thus ...
redshift.vif.com/JournalFiles/Pre2001/V04NO1PDF/V04n1nan.pdf

Shirley Jackson speaks during King celebration express concern ...
Fischbach also quoted the re-. sults of more recent experiments. which seem to support the exis-. tence of, hypercharge, Saulsan ...
www-tech.mit.edu/V105/PDF/N58.pdf

baryon – FREE baryon Information | Encyclopedia.com: Facts ...
(hypercharge or baryon number theory) Science News; 1/18/1986; Thomsen, Dietrick E.; 325 words; ... acting. Fischbach and his co-workers relate this ...
www.encyclopedia.com/doc/1E1-baryon.html

arXiv:hep-th/0111269 v1 29 Nov 2001
the normalization of the hypercharge is determined in terms of the two gauge couplings ..... D. E. Krause, E. Fischbach, hep-ph/9912276. ...
lin25.thphys.uni-heidelberg.de/arcel/hep-th/0111/0111269.ps.gz

D-Brane Standard Model
tion of the hypercharge is determined in terms of the two gauge ..... Krause and E. Fischbach, hep-ph/9912276. I. Antoniadis, et al., D-Brane Standard Model ...
doi.wiley.com/10.1002/1521-3978(200105)49:4/6%3C573::AID-PROP573%3E3.3.CO;2-1 -

IHP 2006 Ground Based Tests of the Equivalence Principle
In 1986 Fischbach et al. (PRL 56 1 pg 3) published a reanalysis of the Eötvös ... hypercharge or Baryon number B/m of the materials. They claimed the ...
luth2.obspm.fr/IHP06/lectures/mester-vinet/IHP-3EPandShortRange.pdf

SPIRES-HEP: FIND C PRLTA,13348
28) Hypercharge Conservation, Cp Invariance And The Possible Existence Of A Zero Mass .... Ephraim Fischbach (Purdue U.) . PURD-TH-83-21, May 1983. 25pp. ...
usparc.ihep.su/spires/find/hep?c=PRLTA,13,348

Utah Space Association - Special Topics - A Plan for Exceeding the ...
In Reanalysis of the Eotvos Experiment, Ephraim Fischbach discovered an intermediate range coupling related to baryon number or hypercharge field, ...
www.utahspace.org/special/exceeding_light_barrier.html

arXiv:hep-th/0111269v1 29 Nov 2001
the normalization of the hypercharge is determined in terms of the two gauge couplings ..... D. E. Krause, E. Fischbach, hep-ph/9912276. ...
arxiv.org/pdf/hep-th/0111269.pdf

EINSTEIN, PLANCK, LAWS OF NATURE AND RELATED THINGS IN ONE OF POUL ...
Fischbach & al. claim [45] that they observed a hypercharge-dependence in Eötvös & al.'s classic measurement [46]. Now, hypercharge is B+S. Assume then that ...
www.rmki.kfki.hu/~lukacs/RHEATIC.htm

The Net Advance of Physics
Quantum Numbers: Hypercharge: Hypercharge-Dependent Forces: ... Fifth force [Wikipedia]; Reanalysis of the Eötvös experiment by Ephraim Fischbach et al. ...
web.mit.edu/redingtn/www/netadv/PHfifthf.html

Energy Citations Database (ECD) - - Document #5961056
Creator/Author, Fischbach, E. ; Sudarsky, D. ; Szafer, A. ; Talmadge, C. ; Aronson, ... of the presence of a new coupling to baryon number or hypercharge. ...
www.osti.gov/energycitations/product.biblio.jsp?osti_id=5961056

Physics with large extra dimensions
the normalization of the hypercharge is determined in terms of the two gauge couplings ..... hep-ph/0210004; D. E. Krause, E. Fischbach, Lect. Notes Phys. ...
pos.sissa.it/archive/conferences/010/045/AHEP2003_045.pdf

Relevance at an Intermediate-Range Force for Neutron-Antineutron ...
coupled either to the hypercharge. or to the baryonic quantum number, ... H. ARONSON, G. J. BOCK, N. Y. CHENG and E. FISCHBACH:. Phys. Rev. ...
www.iop.org/EJ/article/0295-5075/2/2/003/epl_2_2_003.pdf

Hep Structure About Hep Structure | Search | Help structure ...
3) ON THE POSSIBLE EXISTENCE OF A LIGHT VECTOR MESON COUPLED TO THE HYPERCHARGE CURRENT ... By Fischbach, E... May 1983 ...
hepstructure.inr.ac.ru/hep-bin/findcits2.py?key1=1816160&skip=0

String Physics at Low Energies
The weak hypercharge Y is a linear combination of the three U(1): ..... D. E. Krause and E. Fischbach, Lecture Notes in Phys. 562 (Springer-Verlag, 2000), ...
ptp.ipap.jp/link?PTPS/152/1/

Precision experiments to search for the fifth force ...
Fischbach et al. [l 13 identified the fifth force with a ..... baryon number or hypercharge, as described by (4)-(7). Dropping chambers were used from two ...
ieeexplore.ieee.org/iel1/19/4957/00192269.pdf

Physics and Signatures of Extra Dimensions
The weak hypercharge Y is a linear combination of the three U(1)’s: ..... R. S. Decca, D. Lopez, H. B. Chan, E. Fischbach, D. E. Krause and ...
www.slac.stanford.edu/econf/C0709107/pdf/207.pdf

fifth force - Information from Reference.com
The force was believed to be linked with hypercharge. ... Ephraim Fischbach, Daniel Sudarsky, Aaron Szafer, Carrick Talmadge, and SH Aronson, "Reanalysis of ...
www.reference.com/browse/fifth%20force

SOME REMARKS ON LIE-ISOTOPIC LIFTING OF MINKOWSKI METRIC
electromagnetic or hypercharge field, or to the scattering of kaons from stray ..... Cheng, and E.Fischbach, Phys. Rev. D28,. 476 (1983). ...
www.i-b-r.org/docs/lorentz.pdf

Proc. of Intern. Conf. ’Frontiers of Fundamental Physics’, September
electromagnetic or hypercharge field, or to the scattering of kaons from stray ..... Cheng, and E.Fischbach, Phys. Rev. D28: 476. (1983). ...
www.i-b-r.org/docs/greecepr.pdf

A new force in nature?—[AIP Conference Proceedings 150, 1102 (1986)]
Ephraim Fischbach, Daniel Sudarsky@f, Aaron Szafer@f, Carrick Talmadge@f, ... of the presence of a new coupling to baryon number or hypercharge. ...
link.aip.org/link/?APCPCS/150/1102/1

Glossary of the language of Angelus, setting of R A Bragg's 'By ...
fifth force – (n) the hypercharge force; Fischbach's force; the fifth elemental force in the universe with the strong, weak and electromagnetic forces, ...
www.farangelus.com/teekt.htm

Fermi National Accelerator Laboratory
F.T. Meiere and E. Fischbach,. in Baryon Resonances - 73. (West Lafayette,. Ind.:. Purdue), ... Charge and Hypercharge. Exchange Reactionsa). Reaction ...
lss.fnal.gov/archive/1976/pub/Pub-76-035-T.pdf

Sympathetic Vibratory Physics - John W. Keely's Sacred Science.
Text: Some physicists think that a fifth force of nature due to hypercharge may have been found by the Eotvos experiments. See Ephraim Fischbach et al, ...
www.svpvril.com/svpnotes/FIFTH_43970.html

Dr. Ephraim Fischbach and his. colleagues have reinterpreted the ... verification of hypercharge is i. likely to seriously affect the pr ...
www.simson.net/clips/1986/Athena_Columns.pdf

IHEP TCONF 2002 c1-2
However since the hypercharge is a linear combination of the three U(1)'s the .... M. C. Varney and J. C. Price, hep-ph/0210004; D. E. Krause, E. Fischbach, ...
web.ihep.su/library/pubs/tconf02/ps/c1-2.pdf

not exclusively to the hypercharge, but rather to a combination of hypercharge, ... J. Eeg, E. Fischbach, B. Guberina, I. Picek, M. Scadron and D. TadiC. ...
www.slac.stanford.edu/cgi-wrap/getdoc/slac-pub-4788.pdf

Physics and Signatures of Extra Dimensions
hypercharge + B, L, PQ global. • U(1) on top of U(2) or U(3) ? prediction for sin .... Decca-Lopez-Chan-Fischbach-Krause-Jamell '05. Decca et al. '07 ...
www.pd.infn.it/TeV/Pdf_talks/Antoniadis.pdf

<a href="http://arXiv.org/abs/0710.4267v2">arXiv:0710.4267v2 [hep ...
The weak hypercharge Y is a linear combination of the three U(1)'s: .... anomalous hypercharge are also cancelled by dimension five Chern-Simmons ...
www.citebase.org/fulltext?format=application%2Fpdf&identifier=oai%3AarXiv.org%3A0710.4267

arXiv:hep-ph/0312124v1 9 Dec 2003
and its hypercharge (Y). A quantum number alternative to hypercharge is ... vector coupling constants corresponding to hypercharge conserving weak decays G ...
www.citebase.org/fulltext?format=application%2Fpdf&identifier=oai%3AarXiv.org%3Ahep-ph%2F0312124

Hypercharge $ Def: By definition Y: = B + S, where. ... of the fifth force field postulated after a reanalysis of the Eötvös experiment by Fischbach et al; ...
www.phy.olemiss.edu/~luca/Topics/h.html

<a href="http://arxiv.org/abs/0710.4267v2">arXiv:0710.4267v2 [hep ...
However, since the hypercharge is a linear combination of the three ... anomalous hypercharge are also cancelled by dimension ve Chern-Simmons ...
www-library.desy.de/preparch/2007/0710/0710.4267.ps.gz

Papers received as of Tue 1 Jun 99 00:00:02 GMT. (To retrieve ...
... Light Pseudoscalars Implied by Tests of the Gravitational Inverse-Square Law Authors: Ephraim Fischbach and Dennis E. Krause Comments: 12 pages, Revtex, ...
www-library.desy.de/preparch/hep-ph/9906/9906.list

... the Gravitational Inverse-Square Law - by Ephraim Fischbach and Dennis E. Krause ..... 9906344 - Signatures of HyperCharge Axions in Colliders - by Ram ...
lin25.thphys.uni-heidelberg.de/hep-ph/9906.html

New study challenges Galileo's gravity theory - Chicago Sun-Times ...
But a new study theorizes that another force, dubbed the hypercharge, makes objects ... on us right now," said Ephraim Fischbach, principal author of the . ...
www.highbeam.com/doc/1P2-3744875.html

Is Gravitation A Results Of Asymmetric Coulomb Charge Interactions?
Fifth-Force Hypercharge hypotheses and re-evaluations of the Eotvos ex- ..... Fischbach, E., Sudarsky, D., Szafer, A., Talmadge, C., and Aronson, ...
www.math.utah.edu/~gold/doc/grav.pdf

Towards New Milestones in Our Quest to go Beyond the Standard ...
the hypercharge gauge boson. However, since the hypercharge is a linear ..... The case of hypercharge is more subtle since it can be in general a linear ...
www.worldscibooks.com/phy_etextbook/6671/6671_chap01.pdf

Physics and Signatures of the Large Extra Dimensions
hypercharge + B, L, PQ global .... 1st term: hypercharge + fermion singlet ..... Decca-Lopez-Chan-Fischbach-Krause-Jamell ’05 ...
www.lpthe.jussieu.fr/~kbenakli/LHCEra_fichiers/slides/antoniadis.pdf

Orientifolds model building extra dimensions
Decca-Lopez-Chan-Fischbach-Krause-Jamell ’05 .... hypercharge Y = c ... hypercharge + B, L, PQ global. • U(1) on top of U(2) or U(3) ? prediction for sin ...
www.pr.infn.it/snft/2006/papers/antoniadis.pdf

Untitled ... range coupling to the baryon number or hypercharge of the materials was confirmed. ... Author: Fischbach, Ephraim ; Talmadge, Carrick ; Krause, Dennis ...
cfa-www.harvard.edu/poem/docs/Literature/papers.htm

High Energy Physics - Phenomenology authors/titles Jan 1998 (160 ...
Authors: Ephraim Fischbach, Brian Woodahl (Purdue University) ..... Earlier version did not include the one-loop hypercharge $D-$term; this has been ...
arxiv1.library.cornell.edu/list/hep-ph/9801?skip=160&show=100

Mass scales in string theory
11.1 Hypercharge embedding and the weak angle. 11.2 The fate of. U. (1)’s and proton stability. 12. Appendix: Supersymmetry breaking in type I strings ...
www.phy.bg.ac.yu/~mphys5/proceedings2/8-Antoniadis.ps

ANNUAL ISSUE 2006
for weak hypercharge Y then reduces the ..... Fischbach E. and Talmadge C. Ten years of the fifth force. arXiv: hep-ph/9606249, and references therein. ...
www.ptep-online.com/index_files/complete/PP-annual-2006.pdf

Electrogravitational Coupling: Empirical and Theoretical Arguments
However, this data, as reviewed by Fischbach et al. (see ... coupled to hypercharge. There is

considerable uncertainty about the ...
redshift.vif.com/JournalFiles/Pre2001/V0N09PDF/V0N09JAA.pdf

PARITY AND TIME-REVERSAL INVARIANCE IN NUCLEAR PHYSICS
hypercharge (or strangeness)-changing. currents and are therefore propor- ... considered by Tadic (49) and Fischbach & Trabert (50). A different proposal ...
arjournals.annualreviews.org/doi/abs/10.1146/annurev.ns.19.120169.002055

arXiv:hep-ph/0312124 v1 9 Dec 2003
Quark-Mixing,. CKM-Unitarity. Proceedings of the two day workshop. Quark-Mixing, CKM-Unitarity. Heidelberg, Germany 19 to 20 September 2002. Edited by ...
lin25.thphys.uni-heidelberg.de:8080/arcel/hep-ph/0312/0312124.ps.gz

How to Detect Extra-dimensions
hypercharge + B, L, PQ global. • U(1) on top of U(2) or U(3) ? prediction for sin .... Decca-Lopez-Chan-Fischbach-Krause-Jamell '05 ...
www.ccsem.infn.it/issp2006/docs/antoniadis.pdf

String Phenomenology
File Format: PDF/Adobe Acrobat - View as HTML
hypercharge + B, L, PQ global. • U(1) on top of U(2) or U(3) ? prediction for sin ..... Decca-Lopez-Chan-Fischbach-Krause-Jamell '05 ...
ism06.iopb.res.in/talks/Antoniadis.pdf

Gravitation and relativity physics in microgravity
File Format: PDF/Adobe Acrobat - View as HTML
CHAPTER 4. GRAVITATION AND RELATIVITY PHYSICS. Magnetizing. Coils. Magnifer 7904. Copper. Superconducting. Shield. Niobium. Test Mass ...
funphysics.jpl.nasa.gov/technical/library/2000fps-conf/Ch4/ch4_GRP.pdf

THE WEAK NEUTRAL CURRENT AND ITS EFFECTS STELLAR COLLAPSE IN
S, hypercharge Y, electric charge Q, and third component of isospin la are related. according to Y --- S + B and Q = I3 + ½ Y. These relations,facilitate ...
arjournals.annualreviews.org/doi/abs/10.1146/annurev.ns.27.120177.001123

Geometry.Net - Scientists: Von Eotvos Roland
The new force, dubbed hypercharge, challenges Galileo's 400-year-old findings on the ... Under the direction of Purdue Physics Professor Ephraim Fischbach, ...
www4.geometry.net/detail/scientists/von_eotvos_roland.html

High Energy Physics - Phenomenology. Authors and titles for Jan 1998. [total of 332 entries: 1-332] [showing 332 entries per page: fewer | more] ...
arxiv1.library.cornell.edu/list/hep-ph/9801?show=332

Hypercharge Exchange Reactions on Nuclei - W. Briickner,MA .... Scattering - E. Fischbach, JT Gruenwald, SP Rosen, H. Spivack ...
www.sciencemadness.org/lanl2_a/lib-www/la-pubs/00365087.pdf

NationMaster - Encyclopedia: Fifth force
In particle physics, the hypercharge (represented by Y) is the sum of the baryon .... Ephraim Fischbach, Daniel Sudarsky, Aaron Szafer, Carrick Talmadge, ...
www.nationmaster.com/encyclopedia/Fifth-force

63000 lines... only useful for searches. Please go back to ...
... String-Inspired Forces in the Casimir Regime Dennis E. Krause, Ephraim Fischbach ..... hep-

th/9908129, M-Theory and Hypercharge N.D. Lambert, P.C. West ...
dftuz.unizar.es/~rivero/research/refbibli2it.html

Fifth Force - TripAtlas.Com
The force was believed to be linked with hypercharge. ... scales (i.e. with a range of about 100 meters), was reported by researchers (Fischbach "et al. ...
tripatlas.com/Fifth_force

2006 ANNUAL INDEX - PR VOLUMES 73 and 74, PRL VOLUMES 96 and 97
Baryon asymmetry from hypermagnetic helicity in dilaton hypercharge ..... V.B. Bezerra, R.S. Decca, E. Fischbach, B. Geyer, G.L. Klimchitskaya, ...
publish.aps.org/annualindex/2006/authB.html

Fifth_force
The force was believed to be linked with hypercharge. ... Ephraim Fischbach, Daniel Sudarsky, Aaron Szafer, Carrick Talmadge, and SH Aronson, 'Reanalysis of ...
www.napoli-pizza.net/Fifth_force.html

Fifth force - vtap mobile videos
... (Fischbach et al.) who were reanalyzing results of Loránd Eötvös from earlier in the century. The force was believed to be linked with hypercharge. ...
www.vtap.com/topic/Fifth+force/WIKI169552

Talk:Dark energy - Wikipedia, the free encyclopedia - darmowe.org.pl
... related to the fifth force, which apparently interacted with hypercharge. Perhaps the redirect should go there. (My undergrad advisor was Fischbach. ...
darmowe.org.pl/stronki/wiki/index.php?wiki=Talk:Dark_energy

---

http://hepstructure.inr.ac.ru/hep-bin/findcits2.py?key1=16850583&skip=0

REANALYSIS OF THE EOTVOS EXPERIMENT
By Fischbach, Ephraim Sudarsky, Daniel Szafer, Aaron Talmadge, Carrick Aronson, S. H.

LONG RANGE FORCES AND THE EOTVOS EXPERIMENT
By Fischbach, Ephraim Sudarsky, Daniel Szafer, Aaron Talmadge, Carrick Aronson, S. H.

ON THE USE OF EOTVOS TYPE EXPERIMENTS TO DETECT MEDIUM RANGE FORCES
By Milgrom, Mordehai

EXPERIMENTAL EVIDENCE FOR QUANTUM GRAVITY?
By Goldman, T. Hughes, Richard J. Nieto, MichaelMartin

A NEW LONG RANGE FORCE?
By Fayet, P.

EFFECTS OF LOCAL MASS ANOMALIES IN EOTVOS LIKE EXPERIMENTS
By Talmadge, Carrick Aronson, S. H. Fischbach, Ephraim

THE FIFTH FORCE
By Glashow, S. L.

EOTVOS TESTS OF THE NONSYMMETRIC GRAVITATION THEORY AND THE FIFTH FORCE
By Moffat, J. W. Savaria, P. Woolgar, E.

ABOUT THE EOTVOS EXPERIMENT AND THE HYPERCHARGE THEORY
By Elizalde, E.

REMNANTS OF THE FIFTH FORCE
By De Rujula, A.

A NEW FORCE IN NATURE?
By Fischbach, Ephraim Sudarsky, Daniel Szafer, Aaron Talmadge, Carrick Aronson, S. H.

THE FIFTH FORCE
By Fischbach, Ephraim Sudarsky, Daniel Szafer, Aaron Talmadge, Carrick Aronson, S. H.

MULTICOMPONENT MODELS OF THE FIFTH FORCE
By Talmadge, Carrick Fischbach, Ephraim Aronson, S. H.

SEARCHING FOR THE SOURCE OF THE FIFTH FORCE
By Talmadge, Carrick Fischbach, Ephraim

THE FIFTH FORCE: AN INTRODUCTION TO CURRENT RESEARCH
By Fischbach, Ephraim Talmadge, Carrick

PHENOMENOLOGICAL DESCRIPTION OF THE FIFTH FORCE
By Talmadge, Carrick Fischbach, Ephraim

TEN YEARS OF THE FIFTH FORCE
By Fischbach, Ephraim Talmadge, Carrick

Isis, Vol. 86, No. 2 (Jun., 1995), pp. 355-356

Book Review: R. Corby Hovis

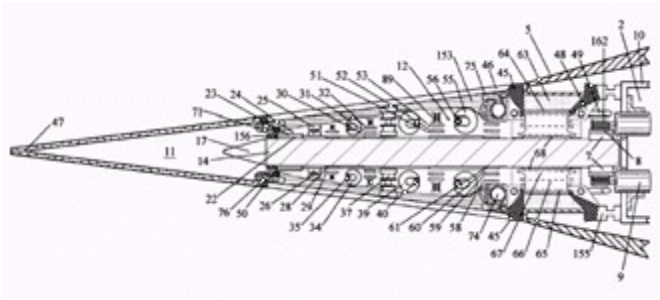
The Rise and Fall of the Fifth Force: Discovery, Pursuit, and Justification in Modern Physics

by

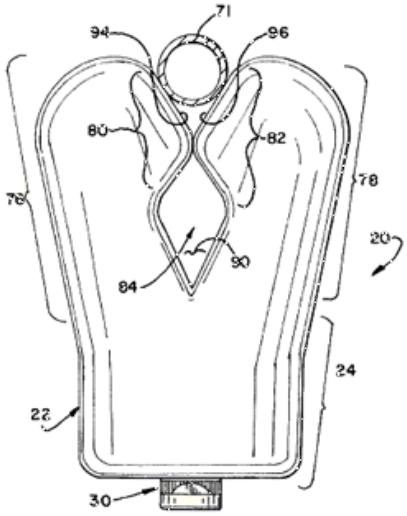
Allan Franklin

US Patents: Force Field Propulsion

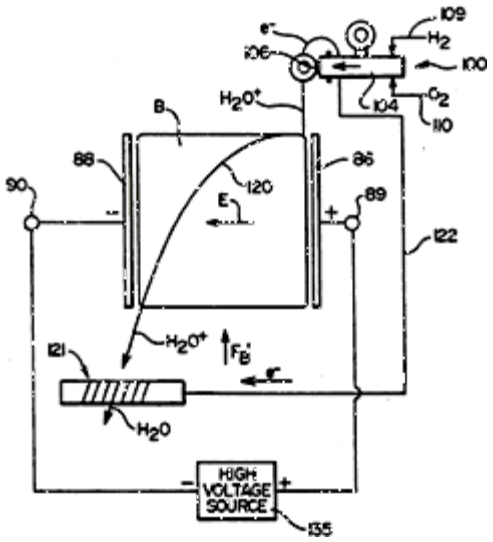
USP # 6,404,089 (6-11-02): Electrodynamic Field Generator
Tomion, Mark



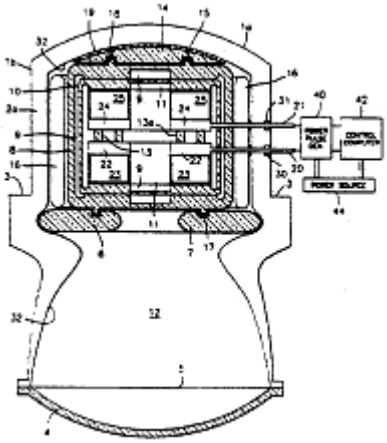
USP # 6,179,250 (1-30-01): Air & Space Vehicle Propulsion System
Waters, Lawrence



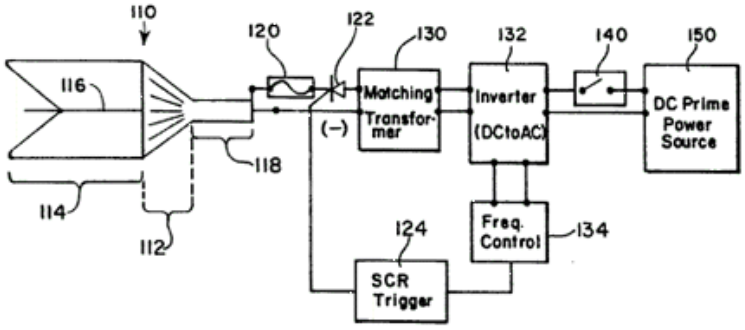
USP # 5,211,006 (5-18-93): Magnetohydrodynamic Propulsion System
Sohnly, Michael J.



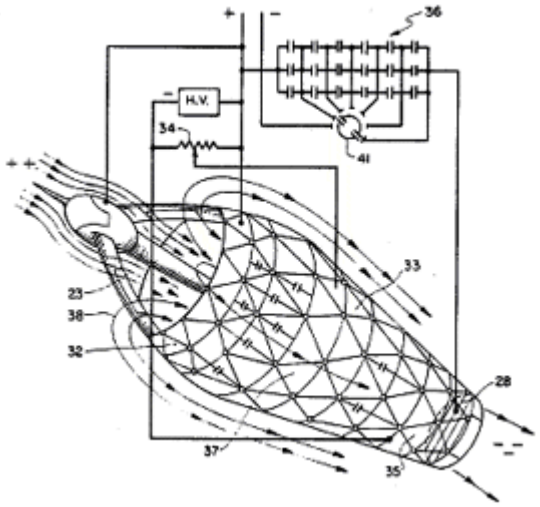
USP # 5,197,279 (3-30-93): Electromagnetic Energy Propulsion Engine
Taylor, James R.



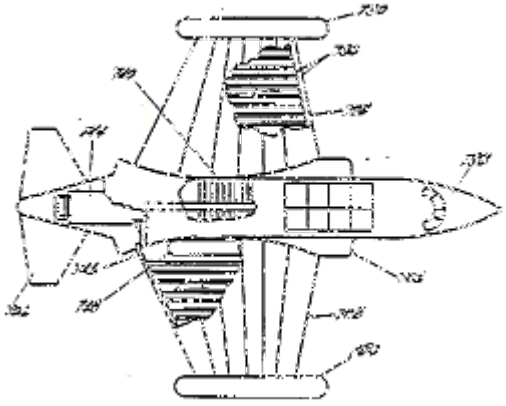
USP # 5,142,861 (9-1-92): Nonlinear Electromagnetic Propulsion System & Method
Schlicher, Rex L., *et al.*



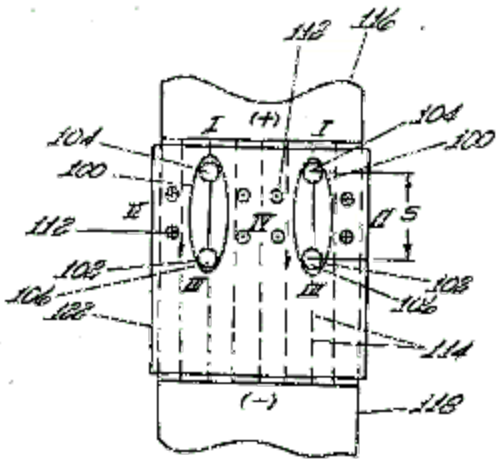
USP # 4,967,983 (11-6-90): Airship
Motts, Brian C.



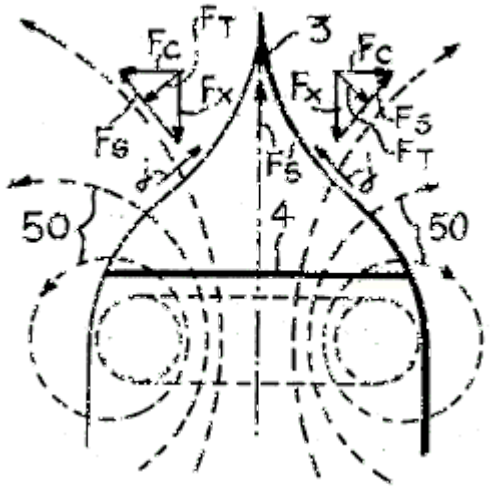
USP # 4,891,600 (1-2-90): Dipole Accelerating Means & Method
Cox, James E.



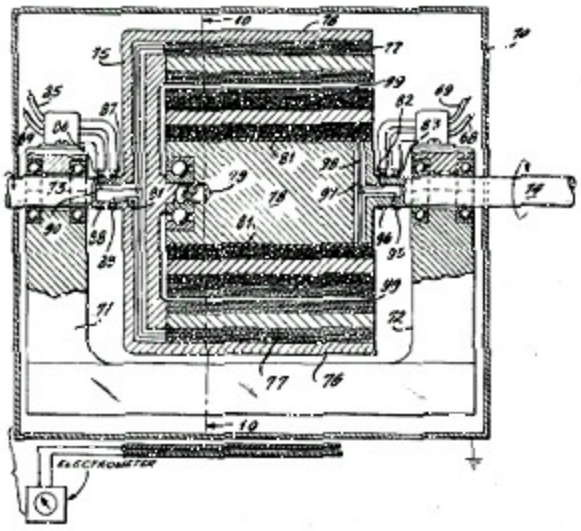
USP # 4,663,932 (5-12-87): Dipolar Force Field Propulsion
Cox, James E.



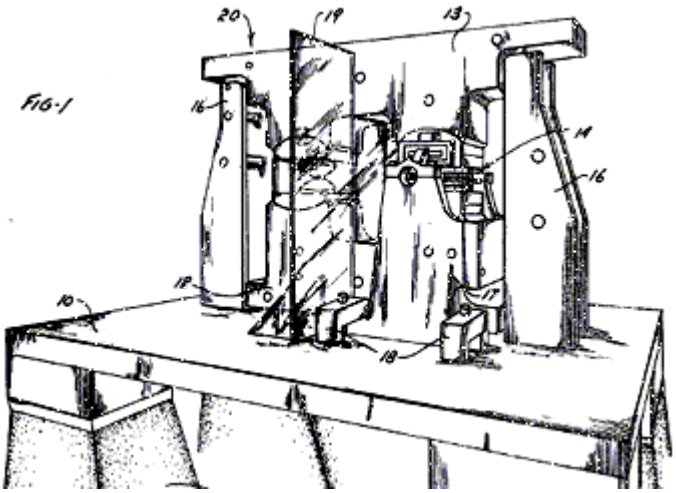
USP # 3,662,554 (5-16-72): Electromagnetic Propulsion Device...
De Broqueville, Axel



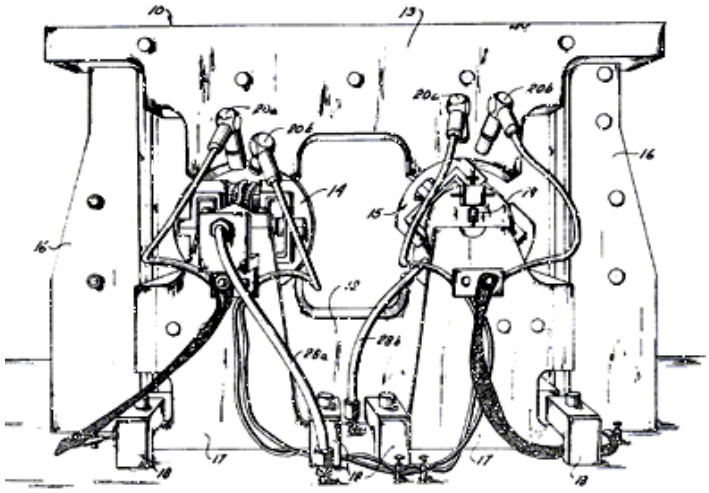
USP # 3,656,013 (4-11-72): Apparatus for Generating a Motional Electric Field
Hooper, William J.



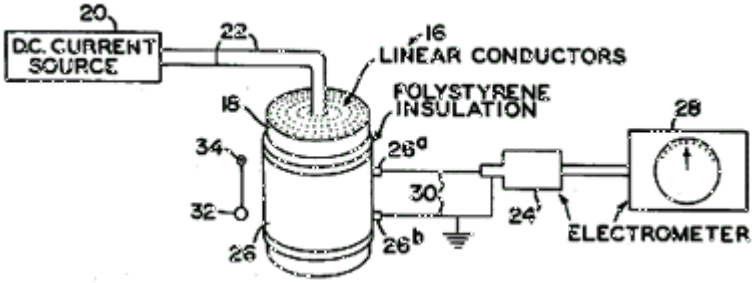
USP # 3,626,606 (12-14-71): Method & Apparatus for Generating a Dynamic Force Field
Wallace, Henry W.



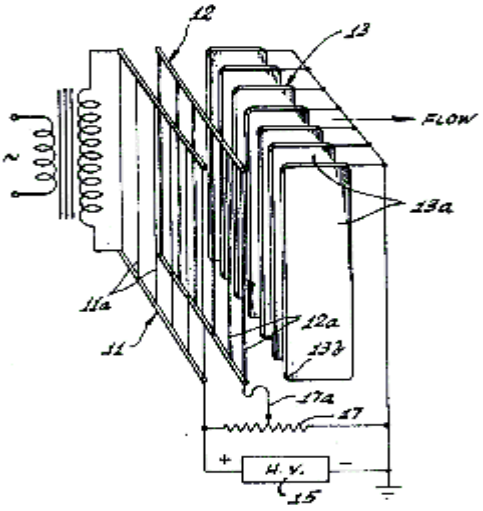
USP # 3,626,605 (12-14-71): Method & Apparatus for Generating a Secondary G-Force Field
Wallace, Henry W.



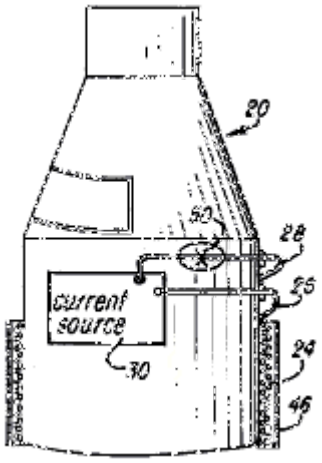
USP # 3,610,971 (10-5-71): All-Electric Motional Electric Field Generator
Hooper, William J.



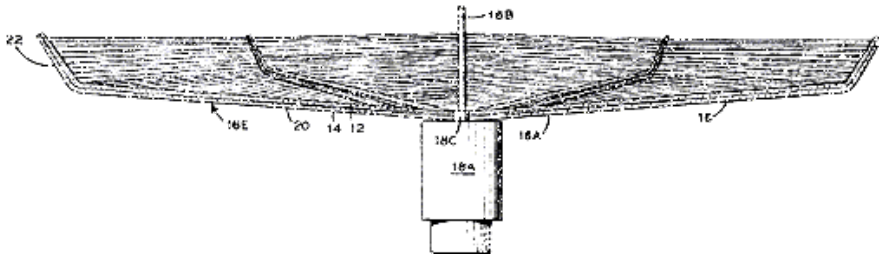
USP # 3,518,462 (6-30-70): Fluid Flow Control System
Brown, Thomas T.



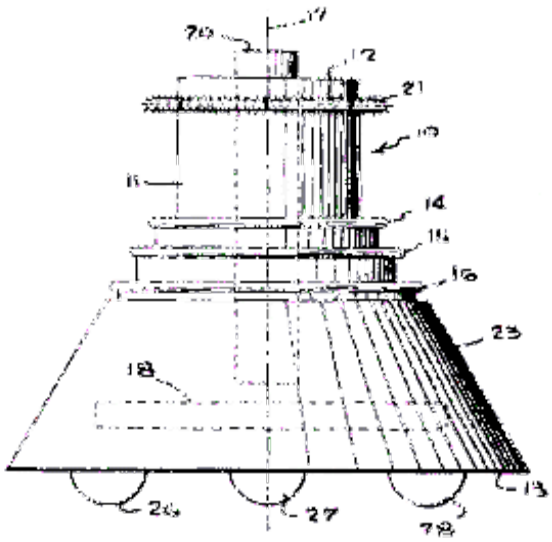
USP # 3,504,868 (4-7-70): Space Propulsion System
Engelberger, Joseph F.



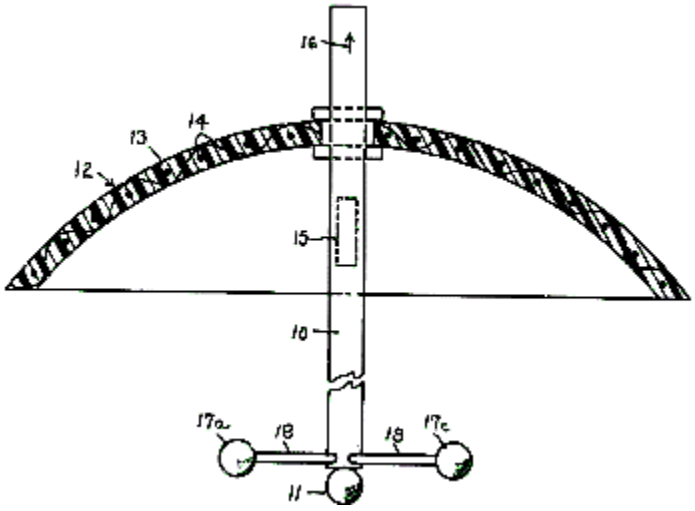
USP # 3,464,207 (9-2-69): Quasi-Corona-Aerodynamic Vehicle
Okress, Ernest C.



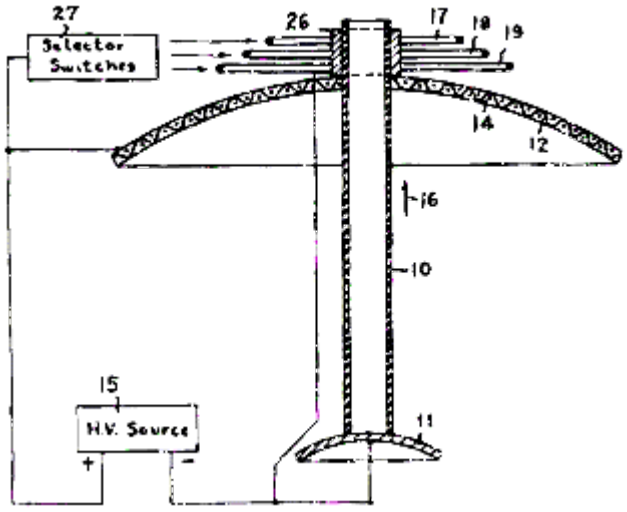
USP # 3,322,374 (5-30-67): Magnetohydrodynamic Propulsion Apparatus
King, James F., Jr.



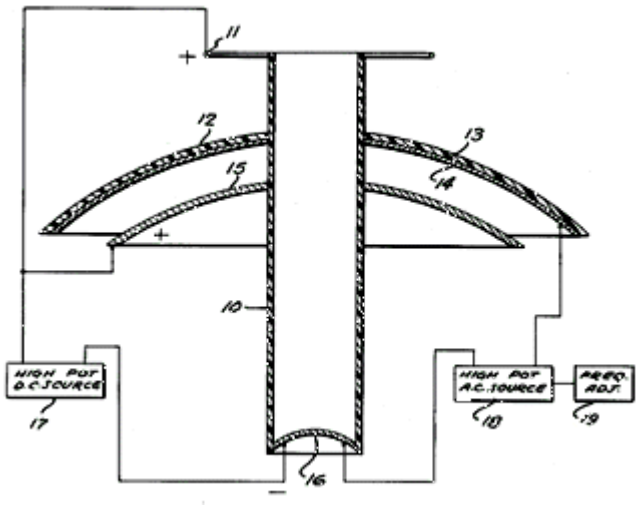
USP # 3,263,1O2 (7-26-66): Electrical Thrust Producing device
Bahnson, Agnew H., Jr.



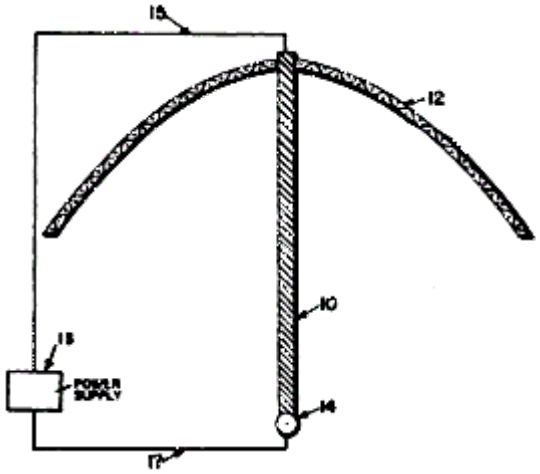
USP # 3,227,901 (1-4-66): Electrical Thrust Producing device
Bahnson, Agnew H., Jr.



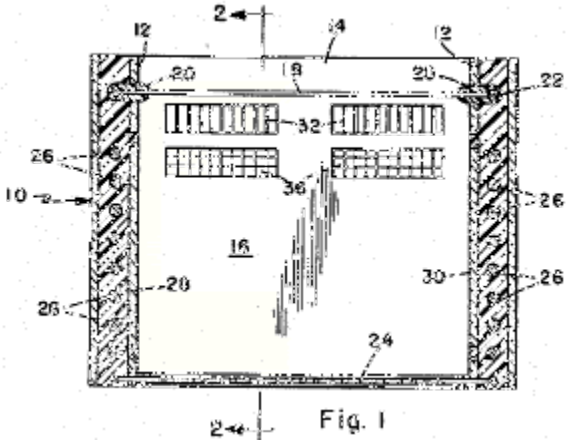
USP # 3,223,038 (7-26-66): Electrical Thrust Producing Device
Bahnson, Agnew H., Jr.



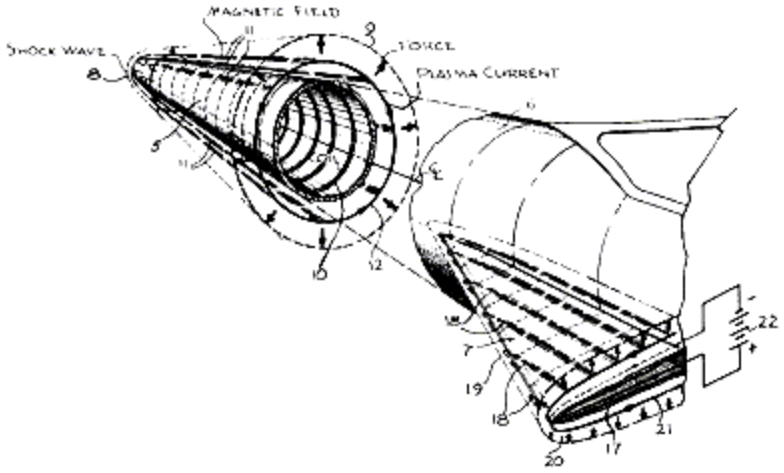
USP # 3,187,206 (6-1-65): Electrokinetic Apparatus
Brown, Thomas T.



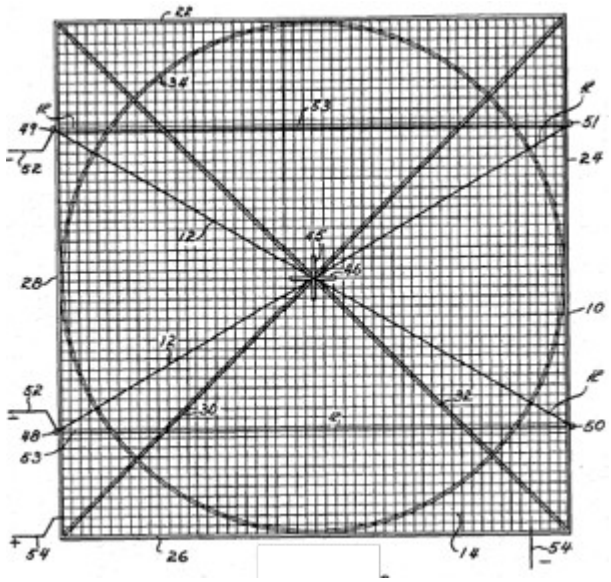
USP # 3,177,654 (4-13-65): Electric Aerospace Propulsion System
Gradecak, Vjekoslav



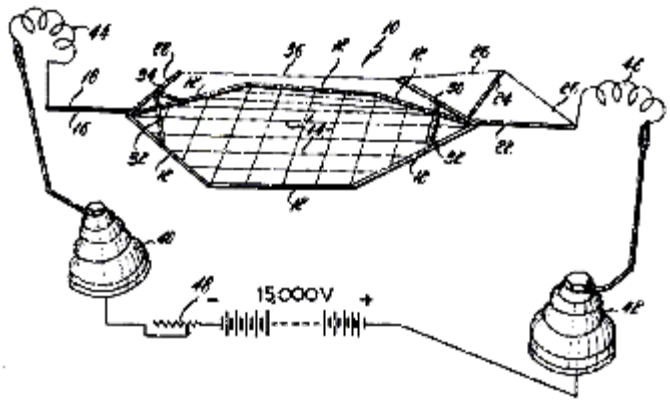
USP # 3,162,398 (12-22-64): Magnetohydrodynamic Control Systems
Clauser, Milton U., *et al.*



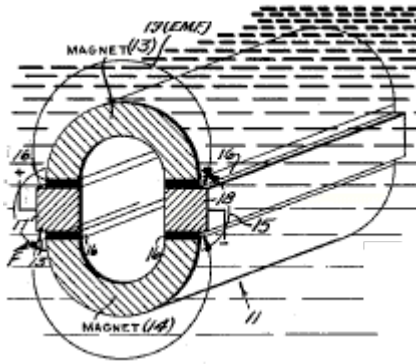
USP # 3,130,945 (4-28-64): Ionocraft
De Seversky, Alexander P.



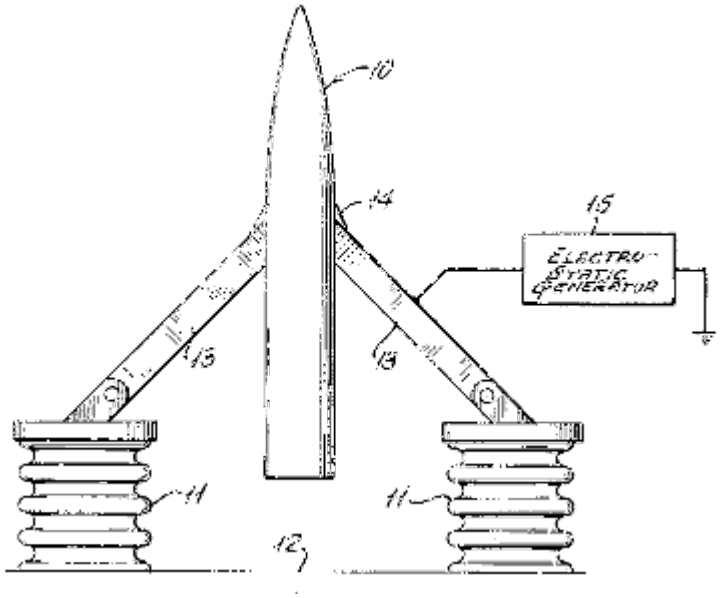
USP # 3,120,363 (2-4-64): Flying Apparatus
Hagen, Glenn E.



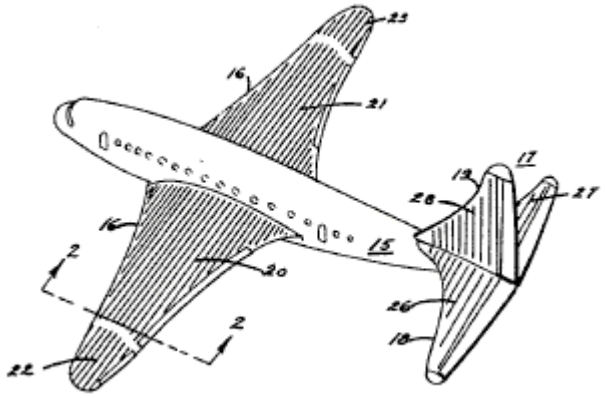
USP # 3,106,058 (10-8-63): Propulsion System
Rice, Warren A.



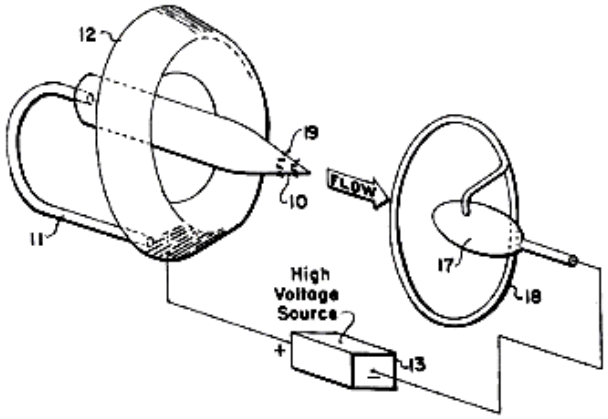
USP # 3,095,167 (6-25-63): Apparatus for the Promotion and Control of Vehicular Flight
Dudley, Horace C.



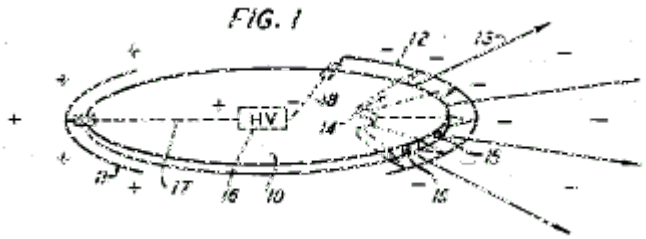
USP # 3,095,163 (6-25-63): Ionized Boundary Layer Fluid Pumping System
Hill, Gilman A.



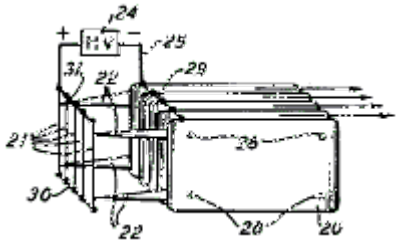
USP # 3,071,705 (1-1-63): Electrostatic Propulsion Means
Coleman, William J., *et al*.



USP # 3,022,430 (2-20-62): Electrokinetic Generator
Brown, Thomas T.



USP# 3,018,394 (1-23-62): Electrokinetic Transducer
Brown, Thomas T.



USP # 2,958,790 (11-1-60): Electrical Thrust Producing apparatus
Bahnson, Agnew H., Jr.

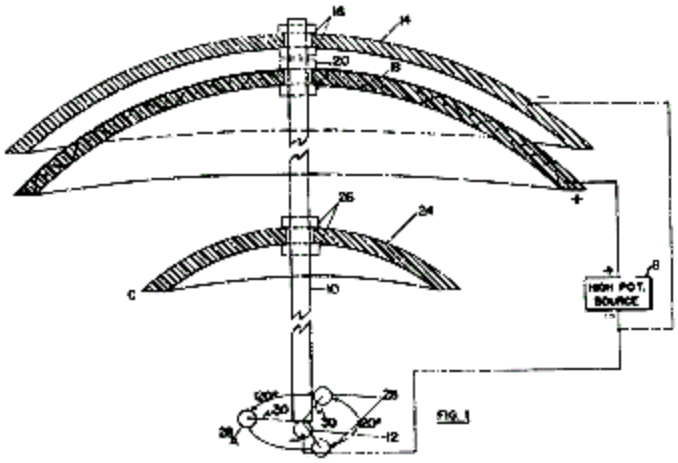
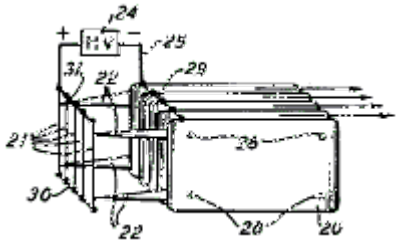


FIG. 1

USP # 2,949,550 (4-16-60): Electrokinetic Apparatus
Brown, Thomas T.



Joseph HIDDINK 1-Terminal Capacitor Capacity Changer

http://www.groupkos.com/eso/tiki-index.php?page=One-Terminal+Capacitor

One-Terminal Capacitor

The Capacity Changer, in all its simplicity, is a pulse-converter of the Coulomb charge upon one plate of a two-terminal capacitor, which becomes a capacitor having only one terminal when the plasma stream inside of a glass tube (commercially available ultraviolet lights) extinguishes. The plasma serves as the disappearing capacitor terminal of the Capacity Changer device.

---

http://www.keelynet.com/interact/archive/00000405.htm as retrieved on Apr 28, 2007 12:59:36 GMT.

One Terminal Capacitor

Jerry W. Decker // KeelyNet
Tue, 29 Jun 1999

Hi Folks!

Comes here an interesting email regarding a 'one terminal capacitor' which you should be aware of thanks to the inventor Joseph Hiddink. This is the email he sent me along with my response and initial questions. Do check it out if you are so inclined;

Ajax, Ontario, Canada June 29. 1999

In 1933, Hitler ordered his Engineers to build a Flying Disk, that could come off the ground, without any sound, could fly at great speed, without any sound, and it had to be invulnerable. His engineers had read about Vandegraaff's ideas.

The Vandegraaff is a monopole high voltage generator, to a degree. Vandegraaff thought, that if he put his sphere to ground,and charged it up to five million volts positive, the sphere would be positive, the ground would be positive, and plus repels plus, ergo: Liftoff.

So he was invited to come to Germany to do it. But when the sphere was on the ground, it only went to 3000 volts, and that did not do a thing. So in 1937 they switched to magnetics. And yes, by 1941, the day before Hitler invaded Germany, they had reached a weight reduction of their Flying Machine of 120 pounds.

Trouble was, the machine, which even looked like a Flying Saucer weighed two tons. So Hitler scrapped it and went in with the rockets.

Seeing a picture of a Flying Saucer in 1967, and noticing these spheres underneath, I asked myself where we use a sphere in the physics literature.

And yes, it was written in the physics books since the 1800's as a problem. Probably thought up by Faraday himself. I got it as a problem on my final exam Physics in Holland. :

Two metal concentric spheres form a capacitor C.

This is charged up to a potential V.

Then the outside sphere is removed.

The remaining sphere is a 1-terminal capacitor with a capacity c.

The potential on this sphere is C/c x V. If C+ 1 microfarad, and c = 50 micromicrofarad, and V = 1000 volts, we get a momentarily pulse of 20 million volts.

And that is positive all alone, or negative all alone. Of course that is difficult to do with these spheres, so the books caution that it was "Just a theoretical problem".

But what if we can make a 2-terminal capacitor that can be charged up, and then can be changed into a 1-terminal capacitor? That is what I invented 30 seconds after thinking about it..

This type of capacitor is inside every sphere, with the 1-terminal part connected to the sphere. As no charge can exist inside the sphere, it flows to the outside.

If a sphere sits on the ground, and gives such a pulse, the first pulse may not do much, but the succeeding ones do. Earth will repel that sphere. And once off the ground, the electrical field off the sphere (with succeeding pulses) "sees" the earth's magnetic field as "ground" and tries to get away from it.

And that is how it works. The saucer shape is nothing but a reflector. Steering is accomplished by applying the proper amount of power to each sphere with a joy stick. A sixteen year old girl with heavy glasses and normal IQ could fly it.

Offered to Canada as a birthday present in 1967, it was ridiculed by the NRC (Canada), as nobody ever could invent such a capacitor, and as thus it was rejected. Confronted many years later with the patent, they had to lamely admit, that it could be done after all, but the NRC (Canada) was &quotSure that it could not work, no funding!&quot.

After which the President of that institution retired immediately But not before exhorting his successor to keep this invention in the ridicule section. His successor became head of the Canadian Space Agency. If you apply for a patent, you need the signature of two witnessse, who declare that they understand the invention.

One of the witnesses required, was a German, now Canadian Engineer, who had worked on Hitler's Flying Disk. &quotMy God, why did nobody think about that before...? Why did I not think about that before...?"

And he told me about Hitler's Flying Machine that never worked. &quotWhen the project was terminated, we were sworn to secrecy about it, but that is nonsense now, you found it. .. Why did I not think about it before...?" He happens to be the world's foremost expert on the parts to make this capacitor.

Offered to Nasa, the Rocket Experts at the Propulsion Lab, where I was referred to, were &quotNot interested, thank you.!" You can figure out why.

We can fly to the Moon in three hours, if need be, uncomfortable. Or in comfort, using a constant 1.1 g acceleration in two days. Mars in a few weeks. No osteoporosis and no barfbags. The Space station and all that nonsense is obsolete.

Of course, anyone who can find out how a Flying Saucer works must be an idiot. that is, what I was told at the different &quotScientific" Institutes in Canada.

Invention was evaluated by Hermann... (forgot his last name) of the Hudson Institute for Strategical Studies at $600 Billion. Now probably Trillion.

Found 1200 applications, from &quotStarwar" cars that float, electrical engines that need only a battery to start, airplanes that reach any place on earth in two hours, all VTOL, no airports needed, to inexpensive power generators, weather control, tornadoes, hurricanes, earthquakes etc... Oil as an energy source will be out. No pollution and no noise.

Just new to the net I will probably get my own site and start to advertise some applications. I have to make some money too. I wondered of course why the Patent Office never figured that this invention should be &quotclassified", but you never argue with the dumbells that look after your security. Your security Council was informed before too.

Threaten the President of the US, and CIA and FBI will be at your doorstep in five minutes. If all of the US could be in danger, if this invention is used by another party, who cares... Do have a nice day.

Regards Joseph Hiddink - President Gravityx
e-mail: vliegschotel@yahoo.com

---

http://www.keelynet.com/interact/archive/00000534.htm.

Joseph Hiddink ((no email))
Sat, 17 Jul 1999

Ajax, Ontario, Canada July 16 1999

Dear Jerry:

I read in one of the missives, that some people are a little bit confused about plusses and minuses of voltages. I will try to explain once again:

Draw a circle on a piece of paper. This represents the sphere.

Now draw a capacitor inside that circle (A capacitor is drawn, electrically, by two parallel lines that do not touch. Make one of the lines solid, and draw a connection to the circle (sphere).

Draw the other line in stipples like - - - - - -, with swiches on both sides of the stipples / - - - - - - \ .

They are in the 'on' position, and that side of the capacitor is active.

Now connect a battery with the minus to the solid line , via a switch. / --

Connect the plus of the battery to the stipple line part of the capacitor, via a switch / , When both switches are thrown, the capacitor C (which will have a size of e.g. 1 microfarad) will reach your battery voltage

Q =3D CV

Now we put both switches that are connected to the battery in the 'off' position. That capacitor is still charged, and the sphere would show 12 volt negative. Now the switches connected to the stipples are put in the 'off' position. That makes that side of the capacitor disappear, the solid line is left, and still connected to the sphere, as a 1-terminal capacitor.

But the capacity is now the capacity of the sphere. And that sphere, if it is a little bit bigger than three feet in diameter, has a capacity of about 50 micromicrofarad.,

That is 1,000,000 / 50 =3D 20,000 times smaller. But the voltage goes up 20,000 times. You get momentarily 240,000 volts. and that is negative in nature, like the solid line of your capacitor. And it carries the whole charge of the 2-terminal capacitor. This part is connected to the sphere.

If that sphere rests on the ground, the ground will try to absorb that voltage. But we, very cunningly, repeat the process, fast. And the ground gets another mouthful. But after a few mouthfuls, that part of Mother Earth gets fed up, and rejects the next appetizer.

The sphere comes off the ground. Sure, the ground will then become obstinate and eventually become positive right under the hovering sphere, which would attract the negative sphere, and as positive attracts negative, crash it, accompanied by a short-distance lightning stroke, but the idea is to get away from it all, and after 'rejection' use the earth's magnetic field to take off to higher realms.

There will be a few guidelines for future Flying Saucer operators, probably on a computer screen.

Regards, Joe Hiddink

---

http://www.mail-archive.com/interact@listserv.capital-master.com/msg00209.html

Re: [Keelynet] Looking for EM experiments not explaind by Maxwell

Wed, 26 Apr 2006

Joseph Hiddink

A Flying Saucer does not have silicon type spheres underneath, but metal ones. They are 1-terminal capacitors. Inside each sphere is a capacitor, that can be changed from a 2-terminal capacitor into a 1-terminal capacitor. When in the 2-terminal capacitor state, it is charged up to about 20,000 volts or less.

Then it is changed into a 1-terminal capacitor, with the 1-terminal connected to the metal sphere on the inside. The 1-terminal capacitor becomes now the capacity of the metal sphere. It is based on a practical application of a problem, devised by Faraday, written up in the physics books as impossible to do in practice. The problem, if you went to High School: Two concnetric metal spheres do not touch and form a capacitor C. This one is charged up to a potential V. Then the outside sphere is removed. The remaining sphere is a 1-terminal capacitor c. The potential on this sphere is momentarily: C/c x V.

Difficult, if not possible to do with spheres, which is the reason that the invention was ridiculed and the inventor insulted up to four months after the patent was granted.

Let me quote from the patent:

If C = 1/10 Microfarad (which is possible with the design) and is charged up to a potential of 10,000 volts, the charge is 1/10 Coulomb. When this capacitor gets changed into the 1-terminal capacitor (a sphere of about 2 meters, with a capacity of about 100 pF), the resulting electrical pulse is about 100 million volts.

Now, a Flying Saucer does not have to go this potential to get lift-off, propulsion and at the same time take power out of the air, unless they would like to destroy a town like Sodoma or Gomorrah. These "Angels" were human, who came in a Flying Saucer.

Tesla had an electric car, with an 80 HP electric motor, an antenna and some electronics. He drove it all the way from New York to Buffalo and back at speeds of up to 90 MPH. No gas. Just like a Flying Saucer, he took power right out of the air.

He refused to tell anyone how it worked, as he realized, that the system could also be used to give every home on earth free electric power. He had designed the Niagara Falls Power Plant for Westinghouse and the investors (Rockefeller and Morgan) would have killed him.

He did not patent it, but I did. My poor wife, reading all the letters of insult and ridicule, was very upset about it and did not want me to work on it, or she would have left me. She died recently amd now I am starting to work on it, slowly, as money is in short supply. Initial experiment in 1967, zapped all the HiFi's and TV's in the neighborhood (I fixed them all for free, but did not experiment at home anymore, as it also blew after a few seconds a big Power Transformer on a pole 100 yards away, luckily a Squirrel was blamed).

Next experiment in the "sticks" had me lightning coming out of the clear blue sky, when I connected the device with a dog-screw to ground, and generated three pulses of 500,000 volts. Offered to Nasa's Propulsion Lab in Cleveland, it was soldidly rejected by the engineers. "Thank you for sending us a copy of your patent!" Who needs a propulsion engineer, if we, when using this system can be on the Moon in a few hours or at Mars in a day or so, no matter where they are located at the time, and all that without barf-bags, heat-tiles, or ostoporosis? I believe that they tried it a few years ago and caused the big blackout in the USA and Canada, blaming a poor, innocent tree.

They did not know about what precautions to take. Any other experiment that you are working on is just a novelty without any real desirable results.

Regards, Joseph H.

http://www.halfbakery.com/user/Joseph_20Hiddink

Joseph Hiddink

Gravity control is so simple, that I (who told the family at age six that I was going to invent that) told my mother on my thelfth birthday, that it was going to be so simple, that a high school student could have invented it. Guess what. The technology was described by Faraday in the 1850's. As a theoretical problem. Unfortunately the learned(?) professors in the years succeeding wrote in the physics books that it only could be done in theory, never in practice. The material to do it existed already in the days of Faraday. I got the problem on my final exam Physics in my (Dutch) High school. Two concentric metal spheres do not touch and form a capacitor C. This one is charged up to a potential V. Then the outside sphere is removed. The remaining sphere is a one-terminal capacitor c. The potential on this sphere is C/c x V. If C = 1 microfarad, and V= 10,000 volts and c = 50 micro-microfarad, we get a potential of 20 million volts. And that is positive all alone, or negative, all alone. Difficult to do with concentric spheres, so I invented a capacitor that can be changed from a one- terminal type to a two-terminal type, gets charged up to 10,000 volts, after which it reverts to a one-terminal type of capacitor. That device is inside these spheres, seen in Flying Saucers. It takes a little bit of capital to build it, but not as much one rocket motor costs for the shuttle. Don't worry, the Nasa Rocket Propulsion Engineers were " Not interested, thank you!". So it probably will be used by another group that is interested in real space flight. We can reach the Moon in one day and Mars inside two weeks. Without the benefit of ostoporosis or barfbags. But who would deny those benefits to Astronauts? Not me. Joseph Hiddink vliegschotel@yahoo.com

[Nov 24 2000, last modified Dec 26 2000]

---

http://patents1.ic.gc.ca/details?patent_number=1043434&language=EN_CA

CA 1043434
CAPACITY CHANGER

ABSTRACT

"The invention provides a capacity changer comprising at least one evacuated glass tube having an ionizable gas disposed therewithin and a pair of mutually spaced electrodes disposed within the glass tube and selectively connectable through a switch to a first power supply, the gas, when ionized, acting as a first capacitor electrode. A conductive coating on the outside of the or each glass tube forms a second capacitor electrode capacitively coupled to the first capacitor electrode when the gas is ionized, the first and second capacitor electrodes thereby forming a two-terminal capacitor. A second power supply is selectively connectable through a further switch between the second capacitor electrode and the first capacitor electrode when the gas is ionized, the second capacitor electrode further forming at least part of a 1- terminal capacitor when the gas is not ionized. The two-terminal capacitor formed by the ionized gas and the second capacitor electrode may be charged and then, when charged, converted into a one-terminal capacitor formed by the second capacitor electrode. In this way, very high voltages may be attained".

From: "Joseph Hiddink" <vliegschotel@yahoo.com>
To: <sterlingda@pureenergysystems.com>
Sent: Friday, June 29, 2007

Subject: Free Energy

Hi All,

In 1967 I had the good (?) luck to figure out the workings of the Flying Saucer. The Propulsion System and how they are powered by taking energy right out of the air or aether.

I built a small unit, went to 150,000 volts, got a heck of a poke and big bang was heard, the light went out. The Power Transformer on a pole 150 feet away had blown up.

I was called out on business. When I came home a new Transformer had been installed. A squirrel was blamed. My TV and HiFi had been zapped. I blamed the Power Company, bought a slew of transistors and fixed the sets.

A few weeks later I went to 500,000 volts, this time using long plastic rods to activate the switches and a scream from the kids above my workshop told me that the TV was on the blink again and so was the HiFi. Then the telephone of \all my neighbours around started to ring. "Could I come and have a look at their TV..?"

Being on of these Good Neighbors of which you read in funny Novels, I fixed all sets for free but did not experiment at home anymore. Next experiment was in the "sticks".

I got a lightning strike on the tree under which my Van was parked, set it afire, scared the daylights out of me and some poor farm dogs, which were instantly transformed into the fastest whippets you have ever seen.

As a good Patriot I decided to offer the invention as a Birthday Gift to Canada. Canada was 100 years old!

It was looked over by the National Research Council, the Scientific Arm of the Canadian Government. They concluded I was an Idiot. Nobody could ever invent the device I claimed to have invented, it said in the Physics Books that it was only a theoretical problem, originating by Faraday in the mid 1800's.

No matter how many times I wrote and explained, they finally wrote to tell me that my letters would be henceforth in the wastebasket, unopened.

Eleven years later, my (US) Patent Lawyer phoned me that the Patent was going to be granted. He urged me to inform the Governments of Canada and the USA immediately. "It is probably the biggest single invention I ever will have worked on and it could quite well be the Nobel Prize for you!"

Dr. Kahn of the Hudson Institute had told him that it had been evaluated at $600 Billion if the USA would have it before Russia. That was for the Space Application alone!

I wrote once more to the NRC. It was still ridiculed. I asked my MP to intervene. Four months after the patents were granted, the President of the NRC, Dr. Schneider, wrote a highly insulting letter (regarding me) to my MP., copy to the Premier, Mr. Trudeau, about this idiot, who did not know anything about Physics and could the Government do something to stop me from pestering them with his nonsense?

I wrote a polite letter to this President, stating that someone must have mislead him, as I had the Patent now. I enclosed a copy of the Patent.

A letter came back: "Yes, I had the Patent after all, but, "they" were sure that it could not work, no financial assistance!"

I offered to come to Ottawa and have lightning come out of the clear blue sky.

No answer. They tried it and the NRC Buildings were hit twelve times inside one hour. That item was even in the Newspapers!

Now they had lost "face". They decided to keep on denying and poohooing this minor invention. In the USA it went to the Propulsion Lab of Nasa in Cleveland, Ohio.

The learned gentlemen there were aghast. Who would need them if we could fly to the Moon in an hour or Mars inside a day?

They were being paid big bucks and were not going to kill the Goose that laid Golden Eggs and (of course not) kickbacks from the different suppliers.

"Not interested, than you for the copy of your Patent!" After the space disasters I believe that they decided to experiment with it and not knowing about precautions to be taken blew their own Power Transformer Station to Kingdom come and a poor innocent tree was blamed for the blackout.. One year after I got the Patents I went finally on the Web and read about a certain MR. Tesla. I realized that he had discovered the same thing. Two years later, while in the hospital with a heart-attack, due to a severe allergic reaction with Cashews. of which I had eaten a tin instead of making a TV dinner when my wife was visiting friends 600 Miles away, my wife came back home. She found the stack of rejecting and insulting letters and concluded that they were the reason for the heart attack. She did not want me to work on it anymore, the strain was too much for her. Love won.

She passed away two years ago and now I am working on it again.

First a unit that takes power out of the air to keep an industrial device with a 72 volt battery constantly charged.

Next, a unit for home power. Then the real electric car like Tesla had. Next the power for air- and spacecraft. The fourth industrial revolution is coming.

To ensure a long and happy life, I have given the complete circuitry to trusted people in Canada, the USA and Europe.

If anything would happen to me it will be splashed all over the internet.

The units will be leased, so as to get a constant income and keep the Tax man happy. Here in Canada the Ontario Provincial Government is not interested, the Politicians have their fingers in the Energy Pie, e-mail and faxes are not anwered. The Federal Government referred me to the Minister of the Environment who is all hopped up on getting the funding of many billions of dollars to bury Nuclear waste. No answer from him either. For 100 Million Dollars we could fly it to the Moon or dump it at Jupiter.

A real spacecraft can be as big as a football field and be crewed like a Naval Cruiser. Don't worry, the US Navy People were not interested, neither were the US Marines interested in a floating of flying vehicle to be used in hilly country like Iraq or Afghanistan . The poor Oil Barons in Calgary got $510 Million to fight pollution. With $5 million I will get better results than they ever will get.

Patents are expired but I left one insignificant item out to ensure that an unfriendly power would not be able to use it.

When I get enough capital I will have to take at least 1000 patents out. There are myriads of applications. It is like inventing the wheel. Of course I might be on the wrong planet this time around.

You also will understand that it is not something that should go to a University.

Any disgruntled student could zap all the Computers, Cell-phones and even car computers.

Regards, JH

US Patent # 4,095,162
Capacity Changer

Joseph Hiddink

June 13, 1978

Abstract

A capacity changer device in which there is a first capacitor means of the 1-terminal capacitor type, and an enclosing hollow metal sphere enclosing the first capacitor means which may be spaced therefrom and being itself a 1-terminal capacitor with a current power supply for energizing a number of evacuated glass tubes containing an ionizable gas and forming part of the first capacitor means. It includes a second power suppy for direct current for charging the first capacitor means and connected also to the metal sphere for combining the charge to form a combination with the sphere of a change to a 2-terminal capacitor.

Inventors: Hiddink; Joseph H. (Ajax, Ontario, CA)

Current U.S. Class: 361/120 ; 307/110; 363/29
Current International Class: H02M 7/42 (20060101); H02M 7/54 (20060101); H02M 009/04 (); H01G 007/00 ()
Field of Search: 321/15 317/244 307/110 320/1
References Cited:
U.S. Patent Documents: 3562629 (February, 1971: Troubetzkoi) // 3652914 (March, 1972: Krausser)

This invention relates to improvements in capacity changers, and particularly, the change in capacity occurring when a small-value 1-terminal capacitor is changed into a substantial value 2-terminal capacitor, or vice versa.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a capacity changer and its construction whereby there is achieved a change in capacity occurring in changing a small-value 1-terminal capacitor into a substantial value 2-terminal capacitor, and vice versa.

Another object of the invention is to provide the means for producing high potentials which can be positive or negative in nature and which are adapted for use in the study of nuclear structure and nuclear reactions.

Still a further object of the invention is to provide a novel and improved means for constuction and operation of a high power particle generator.

Another object of the invention is to provide a novel and improved device for generating potentials of either positive or negative nature of such magnitudes so as to attract, bend or repulse radiation.

Still another object of the invention is to provide novel and improved construction of a device for generation of potentials of either positive or negative nature, to attract or repulse mass.

A further object of the present invention is to provide novel and improved means and its construction for making an inexpensive, yet effective Intense Neutron Generator with possibility for slow to fast neutrom emission.

Still a further object of the present invention is to provide a novel and improved construction of a high power Radio Frequency Transmitter.

Another object of the present invention is to provide the means to generate strong electrical field which can be used to counteract other electrical fields or in conjunction with suitable electronic circuitry to detect interruption of said fields by the infiltration of foreign metal bodies, ore bodies, etc. These fields can be extended to several miles and are not affected by hot and cold layers of water.

Still another object of the present invention is to provide a novel and improved means which makes the generation of super high potentials possible, without having to resort to insulators that would be prohibitive in size or cost.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become apparent from the following description of the drawings, wherein:

FIG 1 shows a simple capacitor consisting of two conducting plates which are separated by a dielectric;

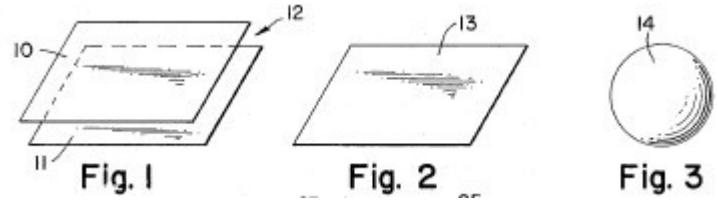


FIG. 2 depicts a 1-terminal capacitor consisting of a single conducting plate;

FIG. 3 depicts a 1-terminal capacitor consisting of a conducting sphere;

FIG. 4A is a schematic circuit diagram showing the capacity changing circuit arrangement consisting of a 1-terminal capacitor and including a non-conducting gaseous discharge tube;

FIG. 4B is a schematic circuit diagram somewhat similar to FIG. 4A showing the realization of a 2-terminal capacitor including a gaseous discharge tube which is conducting, and in which the ionized gas acts as the second "plate";

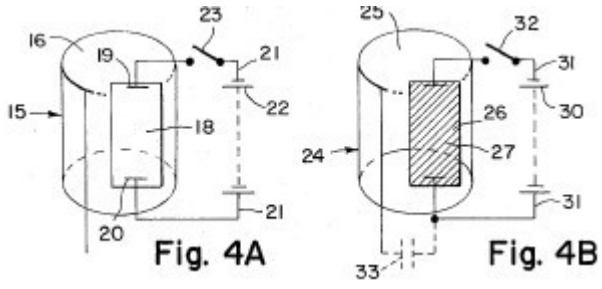


FIG. 5 shows a schematic circuit diagram of a device drawn as a glow-discharge device using a power supply;

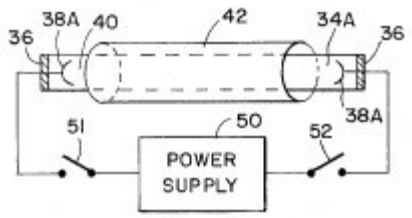


Fig. 5

FIG. 6 is a schematic circuit diagram similar to FIG. 5 but showing a filament type version; and

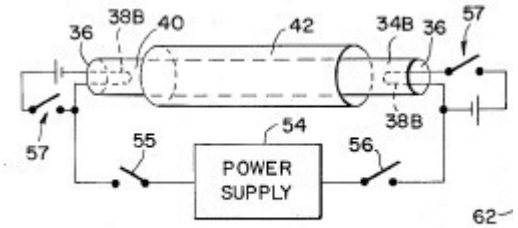


Fig. 6

FIG. 7 is an elevational and schematic view of a composite arrangement including several of the tubes shown in FIGS. 5 and 6 mounted inside a hollow metal sphere, with related power supply sources.

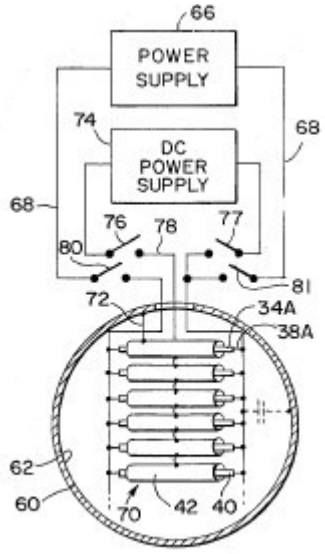


Fig. 7

BACKGROUND OF THE INVENTION

In the past, the changing of 2-terminal capacitors to 1-terminal capacitors have been regarded largely as theoretical problems and devices. As for generators of high potentials, (in excess of 10 MeV), positive, negative or alternating in nature, they have been seen to be costly, cumersom and to need a fair amount of insulation.

The present invention seeks to provide means and construction for attaining the foreging objects at relatively low cost and with good expectation of rewarding results.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In order to understand clearly the nature of the present invention, and the best means for carrying it out, reference may be had to be the drawings in which like numerals denote similar parts throughout the several views.

FIG. 1 shows a simple capacitor consisting of two conducting plates 10 and 11 which are separated by a dielectric medium 12 which may be air or other insulating medium. On the other hand, there is shown in FIG. 2 a 1-terminal capacitor 13 which consists of only the single flat conducting plate 13.

As shown in FIG. 3, there is depicted another type of 1-terminal capacitor 14 consisting solely of a hollow sphere 14.

Formulae for the calculation of the capacitance of various shapes of 2-terminal capacitors and of various shapes of 1-terminal capacitors as shown in FIGS. 1, 2 and 3 are well known and given in various textbooks on electricity. The following shows how such elemental knowledge of capacitors is applied in development of the present invention in a novel form and construction.

In FIG. 4A, the schematic circuit diagram shows the capacity changing circuit consisting of a 1-terminal capacitor 15 consisting of a plate 16 which may be cylindrical in shape, and encloses or goes around a non-conducting gaseous discharge tube 18 made of sealed glass or the like material, with electrodes 19 and 20 inside the tube, and which is connected via lead wires 21 to a battery 22 through a switch 23.

In FIG. 4B, the schematic circuit diagram shows the realization of a 2-terminal capacitor 24 consisting of a plate 25 which may be cylindrical in shape which goes around a gaseous discharge tube 26 which is conducting. The ionized gas 27 within the tube 26 acts as the second plate under the influence of the voltagee from battery 30 delivered via lead wires 31 through the switch 32. The capacitance is indicated by the broken lines 33.

As seen in FIGS. 5, 6 and 7, the basic capacitor of the present invention consists of one or more hollow tubes 34, 34A or 34B, which may be round, cylindrical or any other shape and made of non-conducting material such as glass. All of the tubes have end walls 36 at each end thereof and electrode terminals 38A or 38B are inserted through the sealed glass ends. The tubes are evacuated of air and filled with an ionizable gas 40 such as neon or argon, under suitable pressure. The tubes are partly covered with a conducting substance or coating 42, leaving the electrode terminals 38A and 38B free and insulated from the substance 42. The outside surface of each of the tubes 34, 34A and 34B are now for our purposes substance 42, which is a 1-terminal capacitor.

I have found that is is commercially advantageous to use a tube which does not have a phosphor coating, but which is otherwise similar to those used in the lighting industry. This type of tube, shown in FIG. 6, has heated filament-like terminals which make it possible to construct a high speed or fast-firing glow discharge circuit with a lower firing potential.

Thus, FIG. 5 shows the tube 34A drawn as a glow discharge device, using power supply 50, switches 51 and 52 and electrode terminals 38A. FIG. 6 shows the similar arrangement but with tube 34B connected to the power supply 54, including switches 55 and 56 and starters 57 at each end as is known in fluorescent lamp art.

Looking at FIG. 7, there is shown a hollow metal sphere 60 with a spherical chamber 62, with a number of tubes like those shown at 34A and 42 in FIG. 5 or at 34B and 42 in FIG. 6 inside the chamber 62. The sphere 60 acts also as a 1-terminal capacitor, having its own capacity (C equals

0.556 d) and C is the capacity of pF, and d is the diameter of the conducting sphere in centimeters. Even if each tube 34 has its conducting surface 42 connected to sphere 60, the capacity of the sphere remains the same, namely (C equals 0.556d).

If the gas 40 inside the tubes 34A or 34B is ionized by an ac or dc power supply 66 through wires 68 and the switches shown in FIG. 7, and electrode terminals 38A and 38B as seen in FIGS. 5 and 6, a 2-terminal capacitor is formed herein called capacitor 70. Ionized gas 40 in each tube forms one plate and the conducting surface 42 forms the second plate. The glass tubes 34A or 34B are the dielectric.

This 2-terminal capacitor 70 can be of substantial value, depending on the size, shape or number of tubes 34-42 used inside the sphere. It will be noted that, although the capacitor 70 can have a substantial value, the capacity value of the enveloping sphere 60 remains the same.

Instead of mounting the tubes 34A or 34B in a sphere, they can be mounted in any other type of container with a conducting surface connected to the coating substance 42 by a wire 72 as shown in FIG. 7. However, for some purposes described herein, a sphere is the most efficient form.

The 2-terminal capacitor array 70 can be charged by a direct current power supply 74, via switches 76 and 77 and conductors connected to the electrodes 38A or 38B on the ends of the tubes 34 on one side, and another conductor 78 going to the conducting coating substance 42 on each tube. Whether ionized gas 40 forming one plate of the capacitor or conducting coating substance 42 connected to sphere 60 as the other plate becomes positive or negative depends on the connection of power supply 74. Versatility can be achieved by using three-position switches or relays for switching at 76 and 77 of FIG. 7.

After the 2-terminal capacitor 70 has attained a charge, power supply 74 can be disconnected from the capacitor 70 by means of breaking the charging path via switch 76 or 77 or both. The connection from power supply 74 to conductors 42 should be broken to safeguard power supply 74.

The plate formed by ionized gas 40 in each tube can now be removed by disconnecting power supply 66 via switches 80 or 81 or both. When using a filament-type tube 34B as in FIG. 6, it is advisable to disconnect the filament-heating power supplies via starter switches 57 or both.

When fast action is required in the changing to state from 2- or 1-terminal capacitor operation, the gas 40 can have quenching type additives as known in the art. The charge on the other plate (sphere 60 connected to conductors 42) remains. If capacitor 70 (2-terminal capacitor array) had a capacity of 10 microfarads (which can be attained by using a sufficient number of the tubes 34-42) and was charged up to 10,000 volts, the charge would be 1/10 Coulom (Q equals CV). If the capacity of the sphere 60 was, for example 100 pF (picofarads), the potential which is generated is momentarily about 100 million volts.

It is thus seen that the invention furnishes solutions to various problems as mentioned above, and at reasonable cost of equipment and power supply.

Although the invention has been described in specific terms, it will be apparent to those skilled in the art that there are many modifications, changes and improvements which may be made therein without departing from the spirit and scope of the invention as herein claimed. Further, if desired, the switching arrangements at 76, 77, 80 and 81 of FIG. 7 may be mounted inside the sphere 60, if convenient.

Marcus HOLLINGSHEAD Anti-Gravity System

http://peswiki.com/index.php/PowerPedia:Marcus_Device

Marcus Device

The Marcus Device is a claimed anti-gravity device. Marcus Hollingshead is said to have invented a rotating magnetic field device.

Marcus Hollingshead is a British inventor who in November 2002 claimed to have developed a device capable of overcoming the force of gravity. He referred to this effect as gravitational lensing as he thought the term anti-gravity inaccurate. However, the veracity of Hollingshead's claims are in question despite approximately 30 pages of detailed construction and experimental notes posted to online groups. During that time he was at the center of intense scrutiny and became something of a phenomenon in alt.sci (alternative science) arenas. Hollingshead's claims were unusual in that he:

1. Claimed to have invented (and tested at the University of Cambridge) a 160 kg working prototype (iteration #161) capable of lifting 2040 Kg of weight while utilizing 4.1 kVA of power (about 5.6 horsepower).

2. Publicly posted detailed written descriptions (but no photos) of the dimensions, materials and construction techniques employed to construct the most recent versions of his device. Several individuals generated 3D computer visualizations from his instructions and found the dimensions to be consistent.

3. Claimed that the original intent of the device was not "antigravity" (a term he disliked) but to model geomagnetic forces in the Earth, and that as an inventor he professed no real idea of the theoretical physics behind its operation.

Hollingshead first became known by posting results of his experiments on the BBC science message boards in November of 2002. He claimed that he had created a device that accidentally had collapsed a Black and Decker Workmate table. After modifying and restarting, it allegedly lifted off from his workbench.

The configuration of the devices #161 and #162 (generically known to Hollingshead as "bob") was six rings arranged in three pairs, each interlinked pair slightly offset from each other and centered around one of three axes: X, Y or Z. The rings in each pair were counter-rotated at 4200 rpm. Rings were wound with wire in a bifilar/caduceus manner. Twelve stubs, coil-wound short lengths of rods with flat points, were attached to the inner circumference of each ring and pointed inward.

At the center of the device was positioned a charged multi-layered spherical capacitor (called the RP, for Reference Point). Each coil ring had its own drive and power supply and was powered through a continuous electrical contact. Power to the stub coils was separate from the rings and capable of being timed to coincide with the approach and retreat from its closest point to the RP.

Hollingshead posted that if all the rings are powered and spun in balance there is no net movement of the device. However, a spherical field would form around it, noticeably darkening and blurring the contained zone to a point where the RP is no longer distinguishable and producing a shell coronal effect (purple/violet) in the dark. This field was one of the first non-

propulsive "HAFF" fields produced by the device. It has been suggested but not verified that the acronym HAFF may stand for Hollingshead Anomalous Force Fields, of which Hollingshead reports there are seven.

Reported Field Effects

Hollingshead describes several distinct field effects produced by his devices. Below is a collection of effects in Hollingshead's own words as reportedby Tim Ventura in American Antigravity

Shield Effect

The shield effect is a slowly expanded spherical field that is produced by an altered rp and slower increased power and spin changes. This is complete enough a field to form a vacuum and strong enough to be hit with a rubber mallet and chair.

Tractor Effect

It's possible to produce a 'pull' field effect as well as a 'push'. So far I've been able to focus it for a short period of time on a 5 inch cube of wood 1.8 metres away and then drag the wood back towards the device by 30cm or so, by decreasing the focus range but keeping the power stable.

Temperature Effect

There are some things that you have to keep an eye out for, such as icing up of the rp - but I hope to correct that by heating the outer shell as per a suggestion by Colin.

Vacuum Effect

Vacuum is a deliberate effect of a slowly increased spherical shield, not normally present in moving variants.

Gravity Effect

The device acts to produce a regular gravitational field - the field strength is increased until there is equivalence with earths gravitational influence. Power beyond that is 'lensed' to produce movement the lensing is caused by increasing power above G threshold in one or more of the coils (providing they are not opposites).

Hollingshead reported that if the device were powered up and power to a ring pair were increased, then movement of the device would occur in that direction, even when the direction was counter to the force of gravity.

Speculative Physics

In his audio interview with Tim Ventura in September of 2004 Hollingshead says that there are changes in the nucleus of the iron atoms within the RP (composed of layers of purified iron and kapton as the dielectric). The forces "push protons into becoming neutrons" and soon the iron core is no longer pure iron.

Note: it is true that an antineutrino (nubar ?-) colliding with a proton (p+) will yield a neutron (n0) and a positron (e+), or, ?- + 1p+ —> 1no + oe+. If a positron speeds away, there must be something that flies out in the opposite direction, since it has been determined that the positron momentum is not balanced by recoil of the proton. A neutrino, answering this requirement, is thus also emitted. This suggests the iron atoms become an isotope of manganese.

The result, says Hollingshead, is the release of energy and production of a local gravity lensing effect. However he reports that the diminution of iron in the RP results in nuclear byproducts and a reliable gravity lensing effect for a duration of only 2,000 hours.

Iron comes in four stable isotopes, the most common of which is Fe-56, comprising 91.7% of most terrestrial samples. There is also Fe-54 at 5.8%, Fe-57 at 2.2% and Fe-58 at .28%. If a proton of Fe-56 is pushed to become a neutron the result is Mn-56 (Manganese with 25 protons and 31 neutrons). Mn-56 is radioactive and has a half-life of about 2.5 hours. Thus, an "RP" would be rendered into a radioactive (hazardous) material. This isotope may be the undesired "by-product" Marcus refers to in the interview.

Hollingshead's method of producing his effect through the spinning of electromagnetic fields appears to not follow the work of researchers Ning Li and Eugene Podkletnov who also reported propulsive effects, though by the spinning of superconducting magnets. However, recent ESA-sponsored research by Tajmar, et al (see External links) has produced gravitomagnetic effects through the spinning of superconducting magnets composed of either nobium or lead (dissimmilar to Li and Podkletnov's apparatus) and the artificial gravity field produced was reversible when spin was reversed, similar to Hollingshead's reversible effects.

Tajmar's experimental results have recently been tied to Burkhard Heim's Heim Theory of six elemental forces of nature by Walter Dröscher and Jochem Häuser. In Heim's theory gravito-photons, as of yet unobserved particles, would theoretically allow the conversion of an electromagnetic field into a gravitational-like field. Gravito-photons come in at least two types: one exhibiting repulsive gravitational effects and the other attractive gravitational effects.

Trustiworthiness Questioned

A number of incidents have allegedly taken place that cast further doubt on Hollingshead's claims. Paul Horwood (moderator of Antigravity_open-source group), one of the original few to discuss the invention with Marcus on the BBC boards and to create their own Yahoo group, says: "On all the times I saw him, I did not see the device (and I saw him 3 times and spoke to him on those occasions). The only time that looked promising, I went to Marcus's house and waited outside for him all day (8 hours in all!) and he did not turn up, or return home."

There was to have been a demonstration in early 2003 at Chepstow racecourse, a large building for internal practice of horse jumping. But the demo was cancelled at the last minute as many uninvited "guests" turned up with cameras. Writer Nick Cook of Jane's Defence Weekly (JDW) indicated that he'd dropped by unannouced to get some footage after Marcus had cancelled his first public demonstration (to which Cook had been invited). Cook reported that Marcus relayed a story about "the government confiscating his work" and turned Cook away at the door.

Later that Spring demonstration versions of the device were to have been sent to test areas in Europe and North America. Photos of the device were also to have been sent, but neither devices nor photos were received.

On several occasions, Marcus claimed that it was a hoax. However, he later recanted both that it was a hoax and that the government had confiscated his work, saying that he did it to avoid the intense scrutiny he was receiving (which included receiving several thousand emails a day, according to Tim Ventura of American Antigravity).

According to Paul Horwood, Hollingshead now claims he has a number of engineers working on the device at Thornbury just outside Bristol, Somerset under a contract with the European Space Agency (ESA) to produce propulsion and that he has over 50 million pounds in investment. This area, including Filton, is heavily invested in the aerospace industry, including BAE Systems.

---

http://www.zpenergy.com/modules.php?name=News&file=article&sid=977
October 12, 2004

American Antigravity - Marcus Device Interview

Tim Ventura writes (greenglow yahoo group): Dear All:

I've just completed a 1/2 hour audio interview with Marcus Hollingshead -- the inventor of the controversial "Marcus Device". It was a brief, off-the-cuff overview of his remarkable technology, and I hope to follow up with a more in-depth interview in the near future. I'm busy collecting questions for the follow-up, which I hope will be as informative as the first.

The interview can be accessed from the main page of the website in the news section:

http://www.americanantigravity.com
http://www.americanantigravity.com/interviews2.shtml

Sincerely;

Tim Ventura
http://www.americanantigravity.com
tventura6@comcast.net

---

http://tventura.hypermart.net/documents/The-Marcus-Device-Controversy.pdf.
(April 29, 2003)

The Marcus Device Controversy

by

Tim Ventura

This overview of the Marcus device began as an email response to a request for information on the Marcus device -- a device created by inventor Marcus Hollingshead that encountered more than its share of publicity and controversy between November 2002 and march 2003, before Hollingshead went silent and withdrew from public scrutiny.

The problem with Marcus has been that he was pressured by way too many people, way too fast to produce results. I started talking to him in November, and he's always sounded like an honest, rational man with a good heart. The problem is that once people started to hear his private claims that he could lift something like 2 tons of weight, things kind of went south.

It's not really anything that one person in particular did -- at least not from what I gather. I talked to him on the phone several times, and found the man to be intelligent, well-spoken, and generally altruistic. The problem arose when his daily email jumped to several thousand pieces per day.

Also, while people in general have been very well-meaning, they are desperate to solve many of our current energy-problems, and when Marcus appeared with a potential solution it kind of got out of control. Pretty soon film crews were showing up at his house unannounced, and he was getting unwanted phone calls from people who'd looked up his number online. While he seemed to enjoy conversations with the people in his working group online, having lots of unknown persons call wanting proof about what his device might do can be a scary proposition at best, People in the Antigravity group started getting itchy because he'd promised proof but hadn't delivered, and it degenerated from honest speculation in early January 03 to outright name-calling in late February.

In my opinion, its really a problem of a "social dynamic" at work here -- too many people, with too much access, all at once. This also correlates to the type of person that different people are.

For instance, I am a very open person, and I really don't value my privacy a heck of a lot -- therefore, when TV crews drop by with 5 minutes notice (and they have), I tend to just let them in for a demo. However, Marcus, who is much more of a private person, seems to have become a bit overwhelmed at this proposition.

Also, keep in mind that I had initiated working with the media because I felt that it was time for the excellent work in the Lifters groups to see the light of day. There was some debate about this, but the Lifters group as a whole has greatly benefited from being about to tell people about this new technology.

Marcus hadn't actually "gone public" about his work. He had leaked information about his research to a few people, and from there it was leaked to several others, who in turn told their friends about it. Kinda like a chain-letter, except that in this case there was a real person on the end of it that was affected by all of the publicity.

His inbox overnight went from 10 to 1000 email messages -- he had to take on a second email address just to remain in contact with the people that he usually talked to from before the publicity. Unlike the Lifter technology, which has hundreds of people that can talk about how it works and where it came from, Marcus technology was represented solely by himself. That means that everything surrounding his device came back ultimately to him alone. Without any real group ownership of the expertise behind the device As I said before, Marcus was new to the publicity, and didn't have time to prepare the resources that the rest of us have had to answer questions, provide demo materials, etc. Naudin and Saviour have a masterful manner with regard to teaching people about Lifter technology, but they've had years to prepare this information and perfect a method of presenting it to people. Most of us in the AG groups tend to proselytize for the technologies that we believe in. I know that I do, and if you haunt the newsgroups much you'll notice that everybody there believes in something and can go on for months non-stop telling the world about it (again, I do this).

Marcus, however, doesn't really have this personality -- he's more of a "take it or leave it" type of person. For me, this was another indicator that he was the "real deal". You have to understand that I have never seen working prototype pictures of the Marcus device, and all that I had to go on was the feeling that I got from interacting with him on the phone and online. The fact that he didn't try to "sell me" on the idea was a big plus. He told me about the device, and his story was always consistent. The other people that he talked to also had a consistent story -- I haven't talked to anybody and heard a different version than I heard from Marcus himself. That's a big plus from the credibility perspective.

Again, its the social dynamic here that soured Marcus to things. For instance, Nick Cook indicated that he'd dropped by unannouced to get some footage with Bruce Goodison after Marcus had cancelled his first public demonstration. Cook had been looking for evidence like the rest of us had that Marcus had something real, and not just a "vaporware" claim about a new technology that might not have even existed. Marcus fabricated a cheap story about "the government confiscating his work" and turned Cook away at the door, which is the point at which Nick became soured to the idea himself. I talked to Marcus about this much later on, and he indicated that he'd just made up a story on the spot to get Nick to leave. It had nothing to do with either Nick or Bruce Goodison -- they're both excellent journalists with lots of experience, integrity, and a desire to help the world by spreading news about new technologies. The problem is that at the time when they'd dropped by, Marcus was getting tons of unsolicited email (much of it literally demanding a demonstration) as well as unsolicited phone calls from people he'd never even talked to instantly asking him for both video footage as well as a demonstration of the

device in public. Marcus initial goal (from when I started talking to him in November) was to gradually ease into working with the public to tell them about the technologies he was working on. Unfortunately, I probably aggravated the issue a great deal, because his early descriptions of the technology might have gone unnoticed if it hadn't been for some of the things he'd mentioned about his research.

When I read Marcus' firsts posts on the device, my very first thought about his claims was that they were bogus. Judging from the reaction of the Antigravity newsgroup, I gathered that a few other people also had that same initial reaction. The reason might be a little selfish -- after you hear claims but don't see results for a long enough period of time, you tend to protect yourself emotionally by becoming skeptical to the idea that somebody can be lifting hundreds of pounds of weight using a completely new and revolutionary technology.

Nonetheless, something that Marcus had said resonated with me. I remember that he was talking about his results being based on a study of the Earth's fields, which is something that I'd read about myself during the college years. Telsa had done a lot of work involving the Earth's electrical and magnetic-fields, and I'd always felt that this research might come in handy later as a potential basis for Antigravity research. However, I didn't have any specific ideas, and began asking Marcus questions offline to find out more about his research. So in terms of helping to make things more public I have some guilt about helping things get out of control for the poor fellow, because instead of being able to ask small questions in public without much public knowledge about what he was doing or how he was doing it, all of a sudden I was putting pieces together online, which tended to bring him into more of a public focus. All of the little questions that he'd asked innocently enough to different people in the newsgroups now came into some type of focus in mid-December as indicators that he was working on a new and radically different technology.

In reality, I'm nobody special, so I think that perhaps this would have happened in any event no matter what my reaction would have been. Certainly I'm not the only person that took an early interest in his work, and from what I learned later he'd already been a little bit too honest in the BBC online newsgroup before he ever became involved with the Antigravity newsgroups. From January to mid-February Marcus became like somewhat of an addiction in the newsgroups. This was a strange phenomenon to watch, but if he didn't answer questions in the newsgroups for even a day people started asking whether he'd been kidnapped or the government had assassinated him.

You have to understand that most inventors tend to segregate their time into "public" and "private". I do, Naudin does, heck -- pretty much everybody does this. When you talk to the public about what you've built, you really get into it -- but when you are actually working on it, you tend to hole up in the garage and put the entire world on "ignore" until you've finished with whatever it is that you're doing.
It's not uncommon for me to take an entire week and hole up in the garage without talking to anybody. It can be very rewarding to emerge later with a completed project, and usually I have a few hundred photos that I can post online to answer questions. Naudin is even worse -- he'll go a few weeks without really talking to anybody, but in his case he'll emerge from his lab with a 15-page spread detailing a completely new technology. It's because without the ability to focus and concentrate you're pretty much stuck on being able to develop a new idea.

In the case of Marcus, his research time went from "whenever he wanted to work on it" to "highly-measured". Imagine having to tell people when you want to take a couple of days to work with something he claimed he'd been working on at leisure for 7+ years. Suddenly it

appears that his time isn't his own, and that if he doesn't make sure that everybody knows he'll be away from the computer the entire online community is going to start having panic attacks that he was snatched by 'The Men in Black'. I know that it sounds like I am playing up the publicity aspect of Marcus research, but I'm really not. Nobody, and I mean NOBODY, had any idea how big it would get, and how fast. I typically get about 40 to 50 emails per day. A lot of those are spam from people who get my email address online and want to sell me HgH or Viagra (?), and I typically delete those immediately. The rest are honest questions from persons like yourself that I can answer easily and in a straightforward manner. Last year I went on the Art Bell radio show and Wired Magazine Online did a feature about Lifter technology within a 1-month period of time. Even at that point I was only getting maybe about 300 emails per day -- and most of them were easy to answer, because I'd already written a detailed article that explained a lot about how the technology worked. The people that I couldn't help went to Naudin's site, and many more went to the Lifters online community with its (back then) 700+ members. We were sitting pretty on the media front -- we had the ability to handle the amount of attention that we were getting, and we were able to tell a lot of people about the new technologies as a result.

Marcus literally blew us all away. I KNOW that he wasn't lying about the volume of email that he was getting, because his email box would fill up to "over mailbox limit" about halfway through each passing day. This is within a 1-month period of time that it did this. Marcus really started to get publicity in late November 2002, and it built up over a few week period of time. By mid-December, he had a healthy following in the Antigravity newsgroup and people in the 5 or 10 other AG newsgroups were develping more than just a passing interest. Great stuff for Marcus -- he'd thought that he was the only person doing this research, and it turned out that lots of people shared this common interest with him. We had lots of really valuable and productive exchanges.

Marcus bided his time working on the projects -- he'd initially stated that he could lift around 200 pounds of weight with his November version (prototype #161, if I remember correctly). He didn't have a digital camera, and he didn't want to publish photos until he had a better prototype anyways. That was OK with me -- I'm used to working with a variety of inventors and came to realize a long time ago that everybody has their own style. I was content to wait until Marcus had additional data, and the only thing that I insisted upon was that sooner or later he ante-up and provide some photographic evidence.

Despite lacking photos or video evidence, Marcus did have documentation. In fact, he wrote more documentation about his device than I'd ever hoped to receive. He cranked out about the equivalent of 30-pages of "real" documentation in a very detailed form within 1-month, and had the email equivalent of many more pages in postings about how the device worked online. The compilation that I sent you earlier contains what Jerry Montgomery was able to put together from Marcus postings, and that's based solely on newsgroup correspondence taking place within a 1-month period of time. At that point Marcus had already been publishing details online for about 2.5 months.

Despite the incredible amount of published data that Marcus was able to complete, in some ways it made things worse for him than not having anything at all. The reason was the nature of his research. My work, currently focused on Lifters, was in a technology that's easy to explain -- the device is built like this, it works like that, and it can be described in a manner similar to some other thing ....basic, easy to explain, and easy to compare.

After all, Lifters have been accused by science of being ion-wind devices. If nothing else, rebutting this claim gives us someplace to start -- something to compare against to provide

people with an idea about how the device works. Additionally, we had TONS of video and photographic evidence to back up our claims. We had so much data that the entire group was running out of places to store it online. On the CD-Rom's that I sell on the AAG site, I now have

300+ megs of data -- much of it being photographic and video evidence regarding how the Lifters work. That 300 megs is mostly just my own research -- Naudin probably has a stack of CD's as tall as a book-case containing the work from his website...

In Marcus case, the documentation that he provided made things worse because his technology is so utterly different. It's not ion-wind, nor the Biefeld-Brown effect, nor apparently the Searle effect. In fact, the more than you tried to pin down exactly what it was, the harder it became to describe it.

Also, its not like he could simply fall back onto describing the construction of the device -- reason being that it contained a series of interrelated coils with a unique configuration that were intrinsically tied to the operation of the device. Every time he wrote a detailed summary of the construction of the device, we'd come away with more questions than we'd started out with. After a time I gave up trying to understand how it was constructed, because I only had bits and pieces.

Marcus was using an arrangement of 6-coils, and what are described as "bifilar windings". Essentially, this means that you wind two wires together around a coil and then tie one of the ends to together, making the two wires essentially one long wire wound "against itself" down the length of the armature its on. There are 6 of these armatures on the device, mounted around a central RP (or reference point).

Marcus created all of the terminology for these parts -- this lends additional credibility to the idea that he'd had 7 years of experience with it. These are ideas that you just don't "make up" for publicity. For instance, the bifilar windings on the armature-coils are self-cancelling fields, and even a basic-electronics education will tell you that. However, the interesting thing is that once you really start to get into the advanced "post-scientific" research on magnetic fields you start to see self-cancelling magnetic coils all over the place. The reason is apparently that while the "B-field" of the coils cancel, the "A-field" that Tom Bearden keeps talking about doesn't -- which means that you can isolate the really interesting effects from the coil without having to deal with the high field-intensity effects from normal electromagnetism.

Marcus had described these six armatures as being activated in a series, or order, to obtain results. Each of the coils was spun by an electric motor mounted on the armature, and when the coil was spun up to a certain speed and "stubs" mounted a periodic intervals on the side of the armature were fired in sequence the antigravity effect was created.

Marcus Antigravity effect was a directional force that was applied in a unique manner depending on which coils were activated. This means that by activating (for instance) coils 1 and 3, he could create an antigravity effect AND move the device left -- or something to that effect. Turning on and off each set of coils gave him movement on one axis of thrust, which corresponded to X, Y, or Z in a standard 3-D geometric graph. Since you can move in either direction down any given axis of thrust, this means that you have 6 axis of movement height (up and down), width (left or right), and depth (forward or backward). His device provided movement on any axis by either one coil or an arrangement of coils.

For a while Marcus didn't want to talk about side effects, but I pressured him into it. The reason was that I have seen side-effects that were pretty darned strange in a number of different experiments, and I was willing to bet that if I pressured him a bit he'd talk about what he'd seen

but didn't want to reveal (for fear that people wouldn't take him seriously). It turns out that I was right.....

Marcus had talked about the RP, or "Reference Point" upon several occassions. This is a multi-layered device that acts somewhat like a capactive element. It sits in the direct center of the Marcus device, and it IS the reference-point for the entire device. The RP is manufactured from cast-iron, and Marcus says that he has a local company build them for a few bucks each by pouring iron into a mold based on one of his designs.

You can active the RP at the same time that you activate the coils. You have coils rotating around the RP, with "stubs" on the coils firing periodically at points corresponding to spots on the surface of the RP. Meanwhile, you also have an electrical charge on the RP itself, which means that there are a lot of elements interacting at once to create a very complex dynamic. One of the interesting side effects was a darkening and "blurring" effect of the RP, as if light was being reflected off it. Another was a Star-Trek like "force shield" around the RP. These ONLY occurred when ALL of the coils were activated at once. Also note that since the coils are opposing in nature (one for each direction on each axis), that when you are creating the force field effect the device cannot be levitating. However, the device is operational, and you have a force-field that you can apparently bounce a heavy hammer off of without being able to penetrate it (Marcus description).

Another interesting note is that the force-field effect can be modified to create a vacuum. I'm not sure how Marcus noticed this, but he'd said that it appeared to create a vacuum inside of the field's boundaries during operation. Interestingly, it also ran VERY cold -- apparently down to a hundred degrees below zero, but only within the localized boundaries of the field. I am not a professional physicist, but this is something that has been reported with the Searl effect and several other experiments, and the reason that I believe it occurs is because you are taking the kinetic energy of the devicem as well as some of the kinetic energy of its molecules (ie: heat energy), and injecting it into another dimension. After all, anytime we directly modify a gravitational field we are creating a dimensional effect, but in normal life we don't notice it because the boundaries between gravitational fields are very gradual.

Well, in the Marcus device the boundary between gravitational fields is not a several thousand mile-long gradient like the Earth's field is -- instead of you have a gradient perhaps 10-times more intense focused within a 3 to 4 inch area. That means that you area creating essentially a rift in time and space (self-healing) that is kept open by the energy that you're pumping into the device.

To the best of my knowledge, this is the most accurate description that I have seen yet for why his device does this. Marcus himelf couldn't explain why these effects occurred, and to be honest I scared him more than a little when I told him my theory.

In the hypothesis that I just put forth on the origin and functionality of the Marcus device effect, the interesting this is that there really isn't a direct correlation between input energy and the effect itself. That's because you aren't using the input energy to actually cause an effect -- you are essentially using the input energy to translate the device into another dimension (although it is still partially within ours).

Einstein called these "frames of reference". The idea is that the energy input is used only in putting the device into another frame of reference, but that any interaction between us and our "normal" frame would have to be modified for any interactions with the "modified" frame.

Again, this takes place in normal physics -- but usually it involves motion, and normally it takes place over a vastly larger gradient of time/space/whatever. The difference between two frames is the difference between two locomotives moving at different speeds -- the energy input goes into accelerating each locomotive up to that speed, but the actual work performed if those two trains interact is solely a product of the frame of inertial reference (mass & velocity = energy).

Another excellent example is a helium-balloon. You put the energy into condensing the helium and pumping it into the balloon, but it's not the helium that creates lift --it's the surrounding atmosphere. In a very real sense a helium balloon gets its energy from the surrounding environment. The energy that you put into "maintaining flight" in a helium balloon is only the strain on the fabric used in holding the helium into the confines of the bag that encloses it. With the Marcus device, I'd bet money that its not the input energy creating these effects -- it's instead the difference in frames of dimensional/inertial reference between "our" environment and the "device's" environment, whatever that difference may be.

You see, even though this sounds like a load of BS, magnetism isn't real. This isn't an idea that I'm making up -- in fact, it's an entire chapter in the physics 101 textbook kicking around downstairs in my house. Take two magnetic fields, and project them in the same direction at the same speed. Field A can't interact with Field B, because neither of the fields really exists -- they are merely ripples on a pond, and that pond is the background of the time-space continuum.

People that believe in relativistic gravitational effects take for granted that things like this happen -- after all, gravity isn't a force per se in relativity -- only a modification of the dimensions of time-space. Well, most people don't realize that Einstein based his theory of gravitational force on his study of magnetism. Magnetism is the same thing -- its a modification of the fabric of time-space.

Take the two magnetic fields that didn't interact from a moment ago, and now change the direction that one of them is travelling in. Suddenly, the two fields that coudn't even see each other a moment ago now create an incredible "torque" - this is the same thing that we see in bar-magnets and electric motors. This is the "torsion field" research that Russia spent millions of dollars on in the cold-war, because they understood that magnetism is the MOST misunderstood force in the Universe.

Bar magnets are different than pure fields because they are composed of the discrete fields of thousands of tiny magnetic "domains". That's why the fields from bar-magnets are never "invisible" to each other -- its because that the fields in bar magnets are too jumbled to ever really "line up" to the point of being invisible. Pure fields can do this, however, reinforcing the supremacy of Einstein's relativistic effects with relation to electromagnetism.

Anyhow, that's about it for now -- I will try to come up with a more detailed picture for you on this if you like, but I expect that you will probably have more questions about Marcus theory and device in near future. It's a very complex idea underlying his research, but the basis of it is the idea of "rotating magnetic fields".

If you want to do additional research on your own into related fields of study, I would definitely look up "relativity and magnetism" -- it provides an excellent example of how to visualize relativity theory in the study of magnetic field interactions. This is something that electronics engineers aren't taught, which is why you've never heard of this in an engineering sense before. However, in physics is a well-known concept, although most physicists prefer to work with quantum mechanics rather than relativity these days.

In terms of rotating magnetic fields, you can look up "torsion fields" - again, the Russians have the best understanding of advanced torsion field physics, although their best material probably hasn't been translated yet. Additionally, rotating magnetic fieds are the basis for the Searle Effect and the Hamel device.

Marcus was intrigued by Searle's claims, because they appear to have matched many of his own results. Interestingly, Marcus had developed his work within an "intellectual vacuum" and had never heard of Searle before I told him about the similarities. Nevertheless, force-fields, ice-cold operating temperatures, and antigravity seem to be a pervasive similarity between all manner of experiments that have been reported using rotating magnetic fields. I'd assumed that Searle's claims were bunk, but after hearing about similar effects from Marcus' research its led to to reconsider some of the criticism surrounding Searle lately.

One a final note -- one group that may lend additional credibility to this research is Godin and Roschin in Russia. They obviously benefit from the years of knowledge that the Russians accrued in magnetic field systems theory, and they attempted a replication of the Searle effect device some years back (and claimed to get some results). I hear that they have been working on a revised version of their experimental setup recently and hope to have even better results in the very near future.

Kinda makes you wonder, huh?

Sincerely;

Tim Ventura
http://www.americanantigravity.com &
http://www.americanantigravity.com/marcus.html

---

http://tventura.hypermart.net/Marcus-Drive-Specs.pdf

Marcus Device Drive Specifications

Compiled by Jerry Montgomery

(Feb 13, 2003)

Edited by Tim Ventura, 02/27/03
http://www.americanantigravity.com

… Original Message plus Additions from Other E-Mails
This is built around the E-Mail
From: Marcus Hollingshead <marcus.ho@virgin.net>
To: aggroup@yahoogroups.com<aggroup@yahoogroups.com>
Date: Wednesday, February 19, 2003 12:31 PM
Subject: RE: [aggroup] Full specifications

Hi Group, (Andrew, Colin, Jaro, Jean, Jerry, Michael, and Tim)

To answer Andrews questions - (by the way this stuff is in the pack as well). The dimensions are variable - according to the version involved. Put simply -- What is isn't - It isn't a levitator based on the ‘Townsend’ or ‘Biefield-Brown’ principles, nor a ‘Searle’ engine, nor is it based on superconductors, very high voltages or very large spinning masses.

161 is comprised of 7 charged components, 2 drive mechanisms - one primary one backup - and that’’s it. 6 of the charged devices are coils - the other is a sphere comprising a number of layers some metallic some dielectric.

161 is a 500mm cube, 162 a 700mm cube and 163 a 42mm cube.

161 is rated up to 6.75Kw, 162 to 15.3Kw and 163 to 500W(0.5Kw) 161 is tested to lift over 5200Kg to date 161 is tested to accelerate at over 60m/s^2 Some elements are made for me by engineering prototyping firms.

Description

Toroid -- The coils can be thought of as rings (simplistic view), more a sort of modified toroidal coil. If you imagine the core is a ring of mild steel with a bifilar winding then you are close. One winding is pulsed +ve/-ve the other -ve/+ve offset by 90 degrees. If you imagined the toroid had a central hub (it doesn't) much as a car wheel then the toroid ring spins around its virtual hub at a speed of approx 4,200 rpm. The coils are mounted in individually fixed drive units on the outer edge of the device. The drives house the power take off brushes and drive cogs that spin the toroid in place.

All six coils are 'linked' much as the two links of a chain, but all six are linked together and not in series. Asymmetrically placed for each coil is the charged fixed device termed the ‘rp’. All six coils are free to rotate without impacting each other and each pass very close to one side of the ‘rp’.

No one coil can be made separately and then added. The cores are first linked and precision welded then heated to yellow heat for an hour, annealed and cooled, then the inner stubs are attached with an insulating spacer. The stubs are wound and then each of the coils is wound. The coils are then balanced (for weight)

Each coil is held at the furthest point away from the rp in an adjustable drive capable of spinning them up to 5000rpm (4,200rpm is sufficient). The drive is mounted and connected to each of the coils from an external cuboid frame which is also used to mount the centrally charged device (rp - reference point). Adjustment is made so that the coils do not interfere with each other and run as close as is possible to the rp. The coils spin around a virtual hub -- in plane -- much as a bicycle wheel would do if the back of a bicycle is held up and the wheel is spun. But of course the hub is virtual.

The coils are adjusted so that they pass very close on one side of the rp. (loop position rp)

Stubs

Within the inner circumference are 12 small insulated coils perpendicular to the toroid which are appositionally pulsed -- depending on their spin position relative to the ‘rp’.(diagram loop 4stub shows just 4 of the 12 stubs)

The first versions that produced MAJOR effects were all 6 coils intertwined. (reason is position re rp) I am sure there are other configurations however. Each pair of coils is set in either x/y/or z plane but each pair are obviously slightly out of plane to provide clearance. +ve rotate clockwise -ve anticlockwise. Push follows left-hand rule, Pull follows Right hand rule (rp polarity reversed) ‘Rp’. Rp is physically at the center can be a sphere or pointed shape

Materials

Toroid -- purified Iron. (the latest versions anyway as I've had them cast molded)(variants include steel welded) [3% silicon iron (note this is the same as transformer steel]

Stubs -- purified Iron (Variants Aluminum) ‘RP’

Core -- Purified Iron Core (variants steel, aluminium, copper, gold plated copper)

Dielectric -- Kapton (variants - silicon rubber, ptfe, wafer ptfe, pe foam). Dielectric strengths from 1Kv to 12Kv/mm

Shell -- Purified Iron sphere shell (sectional) (variants -aluminium, steel, gold plated carbon fibre, copper, gold plated copper)

Windings -- Toroid: 15cm torus is 12awg 90 turns. 10/12 AWG bonded bifilar double wound helical 90degree offset. Windings are 30degree to edge, second winding begins one quarter diameter (90 degrees) after the commencement of the first. Each Bifilar winding is 90 degrees offset

Think of a helix, with an out of plane pitch 30 degrees off perpendicular to plane, so as you commence with two wires, beside each other originally then one passes to the right, one to the left of the plane, and then back up and over again. The windings are 120 turns bifilar (helical) on 161 (12 AWG). The windings are 210 turns bifilar (helical) on 162 (10 AWG)

Jaro

"Windings are 30degree to edge, second winding begins one quarter diameter (90 degrees) after the commencement of the first."

30 degrees probably means the section of the toroid ring between the snubs, but does the second winding refer to the second wire (bifilar means 2 wires), or does it refer to winding on the next 30 degrees of the toroid ring? Or do you wind one winding first, and then on top of it a second winding, as opposed to winding the two wires at the same time, next to each other?

Oh, I think I'm beginning to get it. You wind one winding first, and then start the second one quarter diameter of the toroid ring further, but I'm still unsure about the 30 degrees to the edge. And I assume that 90 turns means 90 turns of each of the 2 wires, not total.

Hi -- sorry if it’s not clear. Simplest bifilar arrangement is to take TWO single strands (not bonded bifilar) and hold them so that when you commence winding around the torus you are winding TWO wires in parallel - so the simplest way of thinking of it is as winding a PAIR of wires not just one. In the ones sent there are actually 4 wires (2 pair of bonded bifilar) You'll notice one wire is green one red for each winding pair -- these are parallel connected - I have tried series connected as well. The TWO pairs of bonded bifilar are a counter-wound caduceus (think DNA) coil. These are series connected -- again I have tried parallel.

30 degrees to edge isn't any too clear - I'm sorry - imagine you are looking down on the top of a torus so that it looks just like a rectangular section. If you commence winding so that the wire is being wound (approx.) + 30 degrees from perpendicular to the long axis (or the plane of the torus) then you've got it.

Sorry - meant to say that for the helically wound the cross overs are top and bottom -- so there are precisely STRAIGHT lines of bumps - on the upper and lower median of the torus. Sort of like a spine.

Windings -- 34Awg 10strand Litz heavy pol. Turns 8 (variants 4, 12, 16)

Toroid -- Toroid is a circular flattened ring (variants from 15cm up to 50cm in diameter) Six coils intertwined. Two coils make up the -x/+x -- think of them as left and right. Two coils make up the -z/+z -- think of them as near and far. Two coils make up the -y/+y -- think of them as up and down. Weight of each coil is about 0.7 Kg or 1.5 lbs. x sectional ratio is, width = 1.5* depth (15cm torus 18mm*12mm)

Stubs -- Stubs are flat pyramid bullet nosed cylinders. Height 8mm (variants 6mm) Diameter for use on 15cm Torus =12mm (variants 10mm 8mm and flat topped). Stubs are arranged on the inner circumference of each torus perpendicular to the plane of the torus. There are 12 stubs on each torus. They are arranged 30degrees separation. The stubs are insulated from the main torus by a 0.5mm insulator disc.

'Rp'-- Rp is physically 18mm in diameter (variants 16mm, 20mm 10mm+, 12 section 16mm) (8Kv/mm variant 18mm) parabolic section 18mm, point (variant spherical base 12mm -- virtual sphere 18mm)

Core -- diameter is always at least 5mm less than overall spherical (parabolic concave 7mm less)

Dielectric -- varies 1mm to 1.5mm (point variant 2mm -.5mm at point)

Shell -- 1.5mm thick.

Mounting -- Toroids Each Torus is clamped within a 4 wheeled curved drive - the drives can be powered individually or in groups of three. The drives clamp the torus at the furthest point from the 'rp'. The torus's are always driven (for lift and motion) +ve clockwise, -ve anticlockwise.

Studs -- Stubs are point powered in pairs at the point where two stubs exactly bracket the 'rp' at their closest point.

'Rp' -- 'Rp' is held by six insulated arms woven through the torus sets.

Drives -- Toroids Torus drives are tooth belt and geared drives (2 motors 165) producing maximum rotational speed of torus of 4500rpm - (4220 is sufficient for reliable results) Torus is housed and clamped in position by the drive unit which is adjustable. The drive unit provide power t.o.'s for the stubs and torus coil. For each pair one MUST rotate clockwise, its partner counter clockwise.

Stubs ... So one power take off is for the stubs

Power --- Elements Voltage applied to all components 210V AC Freq 420Hz (variations 220V, 240V, Freq 60Hz, 120Hz, 240Hz 330Hz) All produce similar (although variably efficient) results. Therefore 8 circuits required. Any standard power controls/meters for each Capable of handling the power requirements are suitable. 15cm (165 variant) has a maximum tested power of 3.8Kva (1.7Metric Tonne lift) Toroids All torus coils are powered independently Toroidal inductance depends on dimensions and material used 165 (15cm) 90 turns. 161 is wound 120 turns, 162 wound 200 turns.

Stubs -- All stubs are powered exactly the same and at the same power (motion variant only). The drive unit provide power t.o.'s for the stubs and torus coil. Stubs are powered in steps but all powered equally. Each stub is fired twice per revolution. Power to stubs is never (for motion) more than one half balance on 15 cm torus sets balance power is 0.58Kva power to stubs is therefore 0.29 Kva (210V). (161 balance = 0.72Kva)

'Rp' -- All torus coils are powered independently as is the rp. Electrical connections are by means of the arms. Polarity can be reversed on the 'rp'. Charged negatively antigravity, positively stronger gravity

Actions

1. Lift and drive capability

2. Rapid temperature reduction around the rp -- Approx 100Kelvin when in motion.

3. Loss of reflected light from the rp. Increasing amounts of power (in balance -- i.e., no movement) leads to a gradual darkening around the rp -- eventually to the point where the rp is no longer distinguishable.

4. Inertia less movement -- instant change of direction for the device and anything contained directly in the field -- not true for carried objects that are too large to be so contained.

5. Fixed device (prevented from moving) is capable of exerting a force on unattached objects - pushing them away.

6. Field is capable of being broadened and weakened or narrowed and amplified - termed gravitational lensing.

7. The field is capable of producing an air tight 2.2m diameter spherical vacuum. Maximum lift achieved 5220Kg - power required 6.2Kva (vs 161) Maximum Accn (nonload) 61.2m/ssqd (vs 161)

There is quite a bit more but that covers most things.

Spherical field effect is a production of a standard spherical rp but with all stubs powered and toroids powered beforehand - toroids and ‘rp’ are then spun and powered in phase to produce shield field.

Pull is reverse polarity on ‘rp’ and right hand rule(not left hand rule) for spin on toroids.

The device acts to produce a regular gravitational field - the field strength is increased until there is equivalence with earths gravitational influence. Power beyond that is 'lensed' to produce movement the lensing is caused by increasing power above G threshold in one or more of the coils (providing they are not opposites).

Is that sufficient for now Andrew? - if I've missed any let me know what you need.

Marcus

Anomalous Effects

1. If power is increased to all coils and rp in equal amounts, the device does not move, BUT the area surrounding the rp becomes darker and darker, until at high power loads the rp is no longer discernible. If the lighting levels are low it is possible to make out a shell coronal effect (purple/violet), a sort of hollow ball of plasma surrounding the rp but spaced out from it a few cm's. At very high balanced power the corona appears 'pinched' in towards the rp in the interstices of the coils. This affects radio and other e-m wave forms directed through the rp. Not seen when the device is moving at all.

2. When moving or producing an effect like the laser-lensed field or spherical shield field, the temperature of the rp drops suddenly to approx 100K (-173C). The only tests I have on this are for 161 and the original rp only showed a lesser drop until the rp was improved constructionally. This might get even lower as the device is improved.

3. Turns are immediate, if you take the device up and produce a +X vector, then switch immediately to a +z vector the turn is immediate. Carrying a large load this is not true. It appears anything small enough to be held within the field can be inertially compensated for. It does not 'turn' like a car, but just processes sideways, instead of forwards.

4. A two chambered vessel held within the field, one chamber holding liquid, divided from the other chamber with no liquid shows that anything carried within the field effect also is subject to inertialess turns.

5. The spherical field produces a perfect vaccuum as it is powered up and formed. It also forms a barrier that can be physically felt and hit.

6. The beamed field effect can be used to knock things over or knock a hole through thin sheet copper.

7. Two devices can be used in close conjunction with each other with no obvious interference.

---

http://www.americanantigravity.com

Device Effect Notes

Edited by **Tim Ventura**
(02/27/03)

Vacuum is a deliberate effect of a slowly increased spherical shield, not normally present in moving variants.

… Just to correct:
The shield effect is a slowly expanded spherical field that is produced by an altered rp and slower increased power and spin changes. This is complete enough a field to form a vacuum and strong enough to be hit with a rubber mallet and chair. So sorry - not really an anomalous effect - just one we hadn't discussed. Since then I've refined the design to the point where 161's balance power is about 1.2Kva - with 162 I hope to have this down nearer 1Kva.

University Testing

Current tests on 161 at Cambridge have shown a lift capacity of 2040 Kilos for an overall input power of 4.152 Kva. Or approx 5.6 Horsepower. Overall weight inclusive of 161 was 2162 Kilos therefore overall gross efficiency was 520 Kilo/Kva approx 470 Kilos/Hp.

---

http://english.ohmynews.com/articleview/article_view.asp?at_code=299532&no=264556&rel_no=1
(2005-12-19)

Designing a World Without Gravity

[Part 1]

Gregory Daigle *examines Marcus Hollingshead's 'gravity-lensing' device*

Gravity research is hot. Today, a satellite circles far above the earth measuring the effects of Einstein's Theory of General Relativity. Using rotating spheres ten thousand times smoother than a billiard ball in a near-perfect vacuum, the Gravity Probe B experiment is gathering data to prove (or disprove) if speeding objects drag space-time with them in gravitational fields.

In an adjacent area of research, several labs in Europe and the U.S. are vying to be the first to detect gravity waves. British oddsmakers Ladbrokes gives 6 to 1 odds that gravity waves will be detected by 2010 and several labs say it will happen even sooner. Other researchers are less interested in detecting gravity than in generating gravity. In other words -- antigravity.

As a youngster I read about "cavorite" the antigravity metal discovered by Mr. Cavor and which propelled a spacecraft in H.G. Wells' Edwardian science fiction novel "First Men in the Moon." Until now antigravity has existed only in the domain of cartoons and science fiction. But in November of 2002 one inventor made public that he had stumbled upon a method to produce and

control gravity. Lots of gravity! If successful it would change nearly every aspect of society and how we perceive our place in a three dimensional world.

Like Mr. Cavor, Marcus Hollingshead is a British inventor. But before we stereotype him, he is also an IT consultant and was trained as a biochemist. In November of 2002 he began posting the results of his 12+ years of "tinkering" with geomagnetic models of the Earth on the Yahoo Magnetic-Levitation online newsgroup (which is no longer active). What he reported to other newsgroup members seemed fantastic and more in the realm of science fiction.

Schematic configuration of the marcus rings with RP in the center (artist conception).
©2003 Jay Raney

His posts described a series of experimental devices quaintly known as "Bob." An early Bob crushed his Black and Decker workmate table when it was switched on. Redesigns produced a Bob that produced a "darkening halo effect" around its center when its fast-rotating rings were powered in balance. When out of balance -- it levitated!

At first Hollingshead assumed that the forces being manipulated were magnetic. But a professor from Cambridge acting as a reviewer for his patent attorney countered that it was, " ... motive power without apparent thrust ...", "A new form of propulsion...", "... characteristics appropriate to an anti-gravity device ...". Over a few months in late 2002 and early 2003 fellow experimenters coaxed the reticent Hollingshead to reveal increasingly detailed accounts of his construction and experiments with his most recent Bobs (now renamed versions 161 and 162). And then -- silence.

Since March of 2003 little mention of his ongoing work has made it to the newsgroups. Small wonder. At the peak of his postings he was inundated by thousands of emails a day. Over 100 uninvited "guests" showed up at Chepstow racecourse in February 2003 for a supposedly private demonstration of his technology to Sir Richard Branson of Virgin Airlines, Nick Cook of Jane's Defense Weekly and others. This caused him to shun inquiries, falsely report that his device had been confiscated by the government and, alternately, that the whole thing was just a hoax.

This despite his already having posted on newsgroups pages worth of descriptions and engineering specifications for his version 161, providing enough data for many enthusiasts to build their own computer models. And those computer models all seemed to fit together to form

a complex-but-not-implausible design looking somewhat like a ringed Ptolemaic model of the solar system with an iron sphere at its center where the Earth would be. So were his claims real?

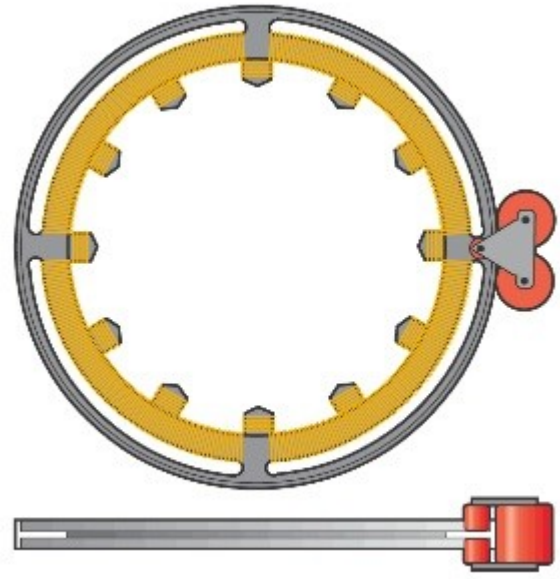
American Antigravity

Tim Ventura, editor of the newsgroup American Antigravity, keeps track of online newsgroup topics such as "tensor fields," "lifters" and other "electro-gravitic" oddities which are the focus of enthusiasts ranging from weekend hobbyists to certified engineers. His experience has given him a good sense of each claimant's level of credibility -- and many are lacking.

You can often identify those with empty claims by their inconsistent facts or their requests for additional funding to pursue unspecified research. To be sure, not all those seeking support for research are scammers. Some are legitimate researchers in the physical sciences working with accredited universities. At least one researcher held enough sway to be contracted both through NASA (in their Breakthrough Propulsion Physics Project) and to ESA (the European Space Agency).

In these past few years Ventura has had several communications with Marcus Hollingshead and conducted one of the most recent and in-depth interviews with him. Ventura gauges his consistency and credibility as high. "[He] always sounded like an honest, rational man with a good heart," said Ventura. Being neither a physicist nor having publicly solicited funding, Hollingshead was and still is an enigma.

In one recorded interview (.WMA) Hollingshead described himself to Ventura as "a complete layman [in terms of physics]", and that when it comes to what's happening in the physics realm, "I really don't understand it." Apparently straight talk from an inventor who describes his discovery as "actually more of an accident." But what he lacks in formal training in the physical sciences, he compensates with quiet persistence and constant tinkering with his device.



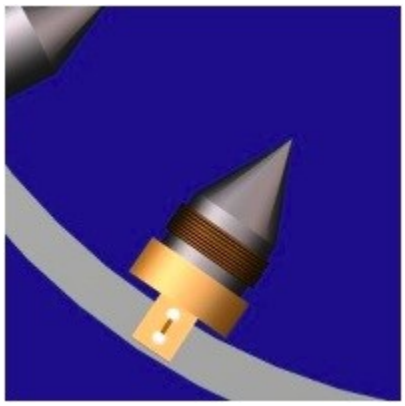
Schematic of ring, stubs and roller clamp layout (artist conception).
©2003 Jay Raney

What makes the "Marcus Device" (not to be confused with the pulp novel by Ib Melchior) work?

The Marcus Device

Along with the strong nuclear force, weak nuclear force and electromagnetic force, gravity is one of the four fundamental forces in nature. Like electromagnetic force (light, radio waves, etc.) gravity gets weaker with the square of the distance. You move it twice as far away and its force is one quarter of what it had been. Move it four times as far and it diminishes to a sixteenth the force. But gravity initially starts off far, far weaker than the other forces. How much weaker? If electromagnetic force had a value equal to 1.0 you would have to move the decimal point 36 places to the left before you matched the weakness of gravity. It's a billion, billion, billion, billion times weaker!

The force of gravity affects all matter with mass. Electromagnetic force affects just electrically charged particles. Imagine how dramatically everyday life has changed since the harnessing of magnetic fields in the late 1880s for industrial and domestic purposes. These range from multi-story dynamos for producing electricity, particle accelerators, vacuum pumps, huge electric motors to drive industry -- down to modest home appliances such as refrigerators, vacuum cleaners or clothes dryers.



Coil-wound stubs (artist conception)
©2005 Paul Horwood

How the Marcus Device creates "gravity-lensing" (a term Hollingshead prefers to "antigravity") is not well established. The nature of gravity itself is not well known. Several theories are in play: string theory, loop quantum gravity -- but no proposed theory has suggested that such a device was within reach.

Physically, the first generation of his devices that produced gravity-lensing fields consisted of six rotating flattened rings. The rings were arranged in offset pairs, each rotating counter to the other. One pair was oriented in the x-y plane, another pair oriented at 90 degrees to that plane (x-z) and the third pair in the y-z plane. None of the rings had hubs. They were all powered by a set of roller-clamps, not unlike the wheels on a roller coaster car. That left the center to be occupied by a spherical capacitor (called the "RP" -- for Reference Point) composed of layers of metal and non-conducting material.

Recall that Hollingshead was originally trying to simulate the generation of magnetic fields in the earth's core. In emulating the circulation of local magnetic zones he studded the rings with pyramid-shaped stubs wound as electromagnets. All the rings were wound with criss-crossing wires to cancel any overall electromagnetic fields. Then he spun the rings at over 4,000 RPMs, timing the stubs to fire at specific intervals and connected it all to a high voltage power source capable of various frequency outputs. Obviously this configuration was not only dangerous to operate but also not one a mere weekend hobbyist is likely to replicate.

What's going on at an atomic level? Hollingshead (and the Cambridge physicist) suggests that the RP focuses the fields generated by his device and pumps electrons into the nucleus of the iron atoms in the RP. In capturing the electron a proton is converted to a neutron and an atom of iron (Fe) becomes an atom of manganese (Mn). The RP becomes a source of gravitational energy just as a light bulb can be described as a source of light (electromagnetic) energy. The RP gradually loses its ability to focus the fields because it is increasingly composed of manganese rather than iron. This diminishing effect has contributed to some of the delays in bringing the technology to market.

HAFF

Ventura and others have persuaded Hollingshead to reveal details (PDF) of recent iterations of his device. These include:

Replacement of its fast-spinning rotating rings with a new solid state design
6,000 to 7,000 kilograms of lift
Seven distinctly different field effects (named "HAFF" 1 through 7)

If you think that overcoming gravity through gravity-lensing sounds like science fiction, then the seven HAFF field effects associated with gravity-lensing are even more fantastic. Five of these fields: HAFF1, HAFF3, HAFF4, HAFF6 and HAFF7 have very practical applications. The others are still shrouded in secrecy.

Re-envisioning the Marcus Device (artist conception)
©2005 Paul Horwood (2005)

HAFF3 relates to thrust, traction and propulsion -- just the thing for providing lift for different forms of transportation in the air or in orbit. This is the only field effect generated while the device is in motion. The other field effects occur when the device is stationary.

HAFF4 constrains atomic motion and reduces temperatures 100 degrees K or more. This makes it suitable for transporting granular material that would otherwise shift its load, or bulk material degraded either by chemical reaction or internally produced heat.

HAFF6 produces standing fields, shearing fields and membrane fields. Shear fields are suitable for manufacturing processes such as punching, shearing and forming of sheet material. Standing fields are suitable for well walls, windows, flood defenses (are you listening New Orleans?). Membrane fields reportedly can be struck with a mallet and the mallet bounces off. HAFF6 fields reportedly can be breached with HAFF1 fields.

Less physical in their outcomes are HAFF7 fields which influence light and electromagnetic fields. Potential applications from these fields include lens optics, light sculptures and 3D displays.

Social Sea Changes

The demonstration of controlled gravity-lensing would be a sea change in everyday life. There isn't a part of our society that wouldn't be affected. Preparing the next generation of engineers, planners and designers to employ HAFF fields would be the first step. How would we imagine the "antigravity" age? Then, how do we design it?

Science fiction writer-critic Ed Bryant was once quoted to have said, "If this were 1890, it would take an inventor to predict the automobile, and it would take a real visionary to predict highways and gas stations. But it would take a science fiction writer to predict the traffic jam."

Demonstrating a gravity-lensing generator today would be the equivalent of demonstrating an electric generator in the early 1800s. It changes the rules. What will be the everyday applications of this technology in transportation, architecture and manufacturing? How will such a technology change social institutions, commuting, privacy or land ownership rights? How does a potentially disruptive and destabilizing technology establish itself without the creative destruction of existing industries? And how long before it just becomes part of the background of everyday living?

When Tim Berners-Lee invented the World Wide Web it took entrepreneurs almost no time to imagine the social impact of browsers and Web sites. If gravity-lensing is successfully demonstrated it could be adopted faster than was the Web.

No doubt there will also be a Web extension for gravity devices, though its difficult to imagine now what it would be. Like the Web's spawning of "i" devices (iMac, iTunes, iPod) and "e" services (email, e-commerce, e-learning, e-government), start looking for "g" devices and services to proliferate.

Public Policy

If gravity-lensing is demonstrated then public policy planning can not afford to wait for wide public acceptance. Every industry potentially threatened by it would begin lobbing for state legislation restricting use and protecting existing commercial interests. Recently, citywide wireless broadband technologies have similarly been blocked by protectionist state legislation backed by threatened cable and telecom providers.

Federal and international regulations should be established to develop standards for usage. International bodies overseeing transportation, trade, manufacturing and other arenas should seek coordination of oversight. Each nation, province, state, even local municipalities would need to develop plans for embracing a technology that could potentially disrupt their economic base in unforeseen ways.

Just navigating those waters would be a growth industry. But it's also an opportunity for institutes and schools of public policy, technology management, transportation, architecture and design to anticipate, forecast, and get ahead of a pending (gravity) wave.

William J. HOOPER The Motional Electric Field

Commentaries & Reviews
US Patent # 3,610,971
US Patent # 3,656,013
Frances Gibson : *The All-Electric Field Generator & Its Potential*
William J Hooper : *New Horizons in Electric, Magnetic & Gravitational Field Theory*
W. Hooper : *Similarities of the Motional Electric & Gravitational Forces* (PDF)

"A Review Of William J. Hooper and his All-Electric Motional Electric Field Generator"

by James E. Hartman
(Feb. 1, 1996)

In the 1960's - William J. Hooper developed what could be a real workable system. In Hooper's view there are three different forms of electric fields due to the distribution of electric field, two are doue to induction. He put forth an interesting theory with the v x B terms of dynamic electrical circuits. He assigns a difference to electric fields generated by differing methods.

The most important for propulsion is called the "motional" electric field. He goes to extraordinary lengths to differentiate the motional electric field arising from:

E = v x B

with an induced electric field due to time changing magnetic field and with static fields related to stationary electrical charge.

To understand Hooper's analysis, consider the Lorentz force from

E = v x B

which Hooper interpreted it as Em, the induced motional electric field.

He claims to have experimentally verified that it is different from other electric fields and that it was akin to GRAVITATIONAL fields.

Unlike electro-static fields this force acts in line with the electric field. One important result is that for the total system the superposition of all B fields can be zero but the motional electric field can still be nonzero.

Consider a long conductor folded back on itself at its center labeled as b. The current then flows from one end, a, to the center, b and then finally reaches the other end, c. the magnetic field from the current flow from a to b is B, and from b to c is -B.

They must be equal and opposite since each has the same current flow (but in opposite directions). Likewise the velocity of the electric charges must also be equal and opposite. The B field is calculated from the sum of the parts, then its magnitude goes to zero.

On other hand, its calculated from super-position of E fields; then it sums to a nonzero quantity. It can be disagreed that either the assumption of superposition of the B field (and hence separability of force fields) is incorrect or Hooper's idea of a "motional electric field" is correct.

Hooper concluded that the magnetic field (associated with currents) moves with the charge carriers within the current. This is consistent with Ampere's law and at variance with Biot-Savart law.

* I'll leave it up to you mathematical majors to affirm this claim.

Two U.S. Patents (3,610,971 and 3,565,013) by Hooper have claimed gravitational-like fields from the motional electric field of v x B.

Superconductors are said to be on the order of 1012 times better than normal conductors and he foreseen improvement in them. Improvement would reflect improved propulsiveness.

Hooper and along with others have claimed to have witnessed the gravitational and ANTIGRAVITATIONAL forces in the functioning of this said device.

The following claims are from U.S. Patent 3,610,971:

"It is desirable to have an apparatus with which to experimentally study gravitational and antigravitational phenomena under steady continuous conditions." "It should be noted that this field is practically uniform and parallel close to the disk, hence it is not attractive in its action on neutral matter. Its action on such matter can only change the state of electrical polarization in the matter. Any change thus effected in the state of polarization should cause the earth's gravitational field to act less intensely, on any object placed
close to the undersurface of the device, causing it to weigh less, become weightless, or to actually be accelerated upward by antigravitational action of the earth's field."

Future Applications

"In a very short interval of time (1969) an intense B x V field should effect the reversal of the gravitational polarization of an object. Once achieved, only a small expenditure of energy would be required to hold the polarization. Energy from atoms of the earth would
supply the lift and propulsion through the medium of the earth's gravity field. The most formidable problem would appear to be the problem of holding the B x V generator at cryogenic temperatures. In view of the overall possibilities of this invention, this problem does not appear to be incapable of a solution. A breakthrough in finding superconductive materials or even near superconducting at slightly elevated temperatures from those presently (at that time) required would greatly aid in the solution of this problem."

In Fig. 4 - "The antigravity gravity control features of the coils 73 and 74 thus control the lift and movement of vehicle."

Final thoughts

What was this man's drive?

"This country's space projects have become expensive beyond the ability of the of the average man to comprehend. Achieving lift by means of costly propellants will someday soon be seen as akin to primitive man's use of awkward clubs as a means of exerting force."

With the ozone layer hole seemingly growing larger every year. Perhaps, I speculate that project HAARP in Alaska was built to produce OZONE to heal the earth's atmosphere. Such devices has Hooper's may give off charged negative ions and therefore may aid in the healthfulness of

humans (Hence, the Home Ionizer) as well healing the atmospheric properties over a longer period of time.

With advances in new superconductivity technologies and with a NASA budget that is shrinking. What a real bargain for the tax payer and the well-being of our atmosphere.

With a $35B dollar a year NASA budget. They perhaps could build a small fleet of nice B x V reusable Spacecraft and aircraft that are perhaps environmentally more sound.

---

http://www.padrak.com

"Electric Propulsion Study"

[Excerpt]

by

Dr. Dennis Cravens, SAIC Corp; prepared for USAF Astronautics Lab/Edwards AFB (August 1990)

Section 3.7: Non-Inductive Coils

Several authors have suggested that v x B term in the Lorentz expression should be called into question. Several unverified experimental results have ever been made. An experiment is suggested to test one or several of these theoretical views. This is an area where the experimental procedure is workable and the outcome could have direct results in the area of inertia forces.

During the late 60's William J. Hooper put forth an interesting theory involving the v x B terms dynamic electrical circuits. There was and is uncertainty as to the exact physical understanding of the Biot-Savart-Lorentz law and Ampere's law involving the set of reaction forces. Peter Graneau has studied these expressions. Hooper's view was that there are three different types of electric fields due to the distribution of electric field and two due to induction.

At the heart of the issue is the connection of the magnetic field and its source in the charged particles. EM theory is presently consistent with the idea that spinning magnetic dipoles create effects indistinguishable from charged particles. There has been no critical experiment which can disprove whether a magnetic flux rotates with its source. If it does co-move with its source then it is logical to assume that a motional electric field in a fixed reference frame of the current induces a magnetic field. This concept is likewise consistent with a field-free interpretation such as Ampere's original laws. [with 4 pages more about Hooper's theories]

US Patent # 3,610,971

All-Electric Motional Electric Field Generator

by
William Hooper

Prior History ~

The detection of a magnetic flux about a current-carrying conductor was first made in 1820 by Hans Christian Oersted. This discovery unified the then separate sciences of electricity and magnetism. My experimental discovery that this magnetic flux actually moves along the conductor electric charges, the electric charges constituting the current, has great promise of now

unifying the three known fields of electricity, magnetism and gravitation.

For a better understanding of the invention, reference should be had to the accompanying drawings wherein:

Figure 1 is a schematic block diagram schematic of a preferred embodiment of the invention;

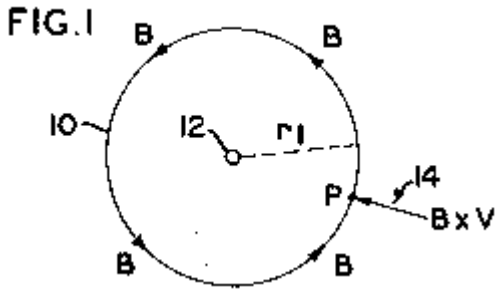


Figure 2 is a perspective block diagram of a preferred embodiment of the invention;

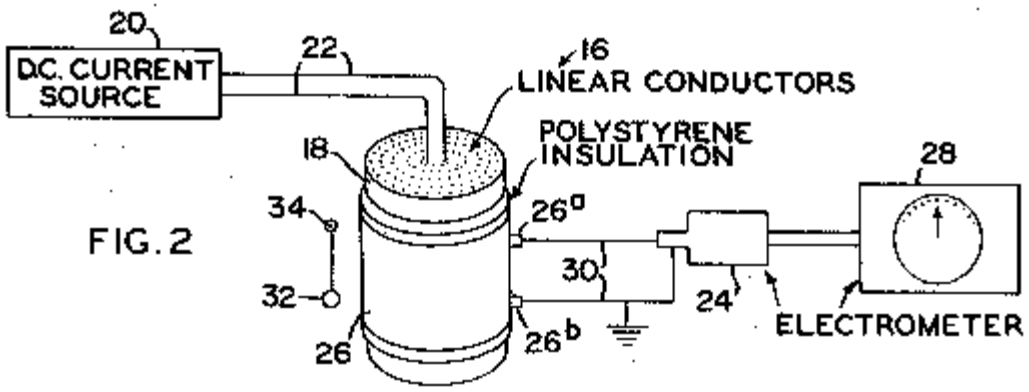


Figure 3 and Figure 4 illustrate modifications of the generator of Figure 2 adapted to techniques for studying and utilizing gravitational and antigravitational phenomena;

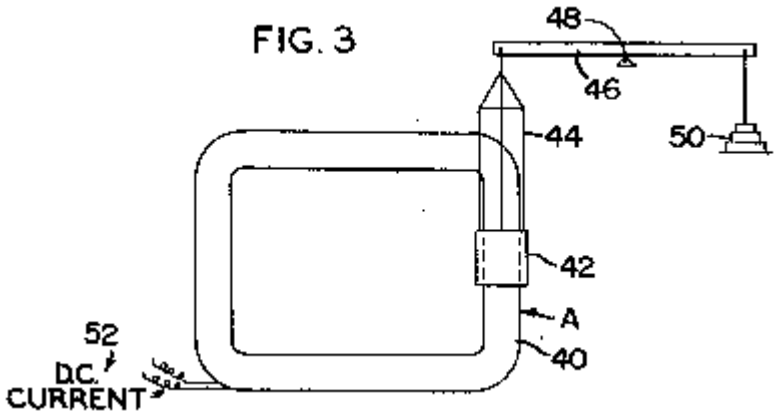


FIG. 4

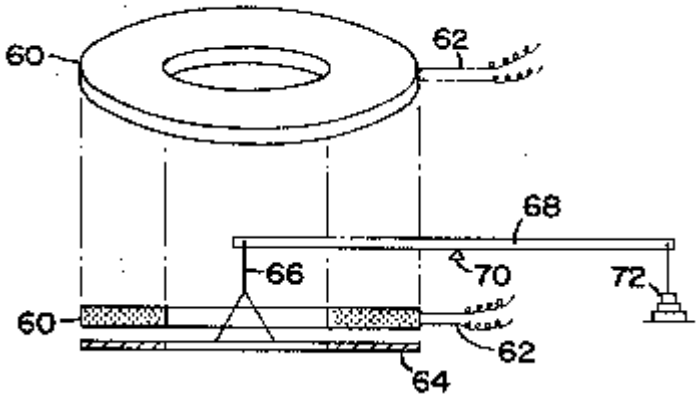


Figure 5 illustrates the winding of the wire in the device of Figure 2;

FIG. 5

Figure 6 illustrates the winding of the wire in the device of Figure 4;

FIG. 6

Figure 7 illustrates the incorporation of a plurality of the devices of the invention into a spacecraft where they might be appropriately utilized; and

FIG. 7

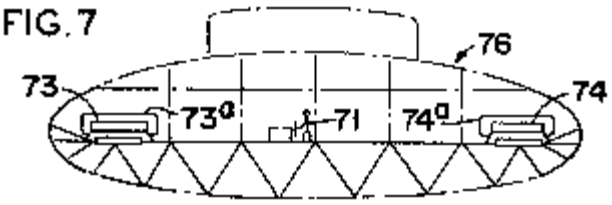
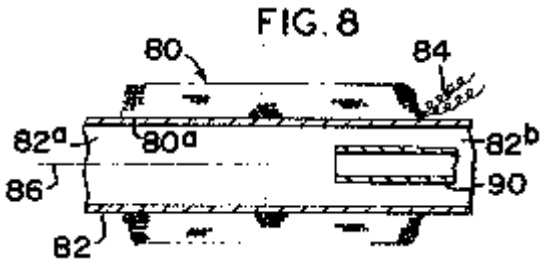


Figure 8 illustrates a coil wound embodiment useful for producing the separation of oppositely charged ions in gases or liquids.



Background Information ~

The law of Biot and Savart yields the magnetic flux density B (webers/m^2) at a point distant *r* meters from the conductor carrying a current of I amperes and is given by

(Eq. 1) $B = m_o I/2pr$

where $m_o = 4p \times 10^{17}$ webers/amp meter. With reference to Figure 1 of the drawings, this flux consists of circular magnetic loops directed counterclockwise, as shown by arrow 10, for current directed in a linear conductor wire 12 at right angles to this paper and outwardly toward the reader.

Electrons producing this flux will be moving perpendicularly into the paper, carrying the flux B with them, at a velocity V meters/sec. Thus, at any point P, distant r_1 from the long linear conductor 12, there will be existent a motional electric field of intensity E = B x V volts/meter directed radially inward toward the wire in the plane of the paper, as indicated by vector arrow 14, where BxV is the vector cross product of B and V.

Preferred Embodiment ~

The preferred embodiment of the invention is illustrated in Figure 2 and consists in part of many insulated linear conductors indicated generally by numeral 16, all parallel, packed and held in close proximity, and connected in series, so as to form a solid package 18 preferably cylindrical in shape. When a constant direct current from a source 20 is caused to flow through wires 22 this device with its axis in the vertical direction, half of the linear conductors 16 will have current flowing upward and half downward. It will be a noninductive device, since surrounding it the magnetic flux due to the upward currents will be superimposed on the flux due to the downward currents, so that no magnetic flux can be measured. On the well-recognized "Principle of Superposition of Fields", each one exists, however, and acts as though the other was absent.

When the package 18 of linear conductors has a circular cross section there will exist two systems of circularly directed magnetic flux, one directed clockwise and the other counterclockwise as seen from above, and one set moving upward and the other set moving downward. What is of capital interest, however, is that each of these two systems give rise to equal radially and inwardly directed BxV motional electric fields distributed laterally in horizontal planes in the space about the cylindrical device. Here we have a field which is not magnetic, is not electrostatic, and which I have shown experimentally to be immune to electrostatic shielding. No such spacially distributed field is known to Physics today except that of gravity. I have shown theoretically that this field should act attractively on electrically neutral matter. I have shown experimentally that the intensity of this field can be measured with the aid

of an electrometer system 24, 28 driven by the potential difference induced electromagnetically in the conductors 30 connecting the electrometer to the capacitor plates 26a and 26b of the capacitor 26. The electrometer head 24 actuates a visual dial indicator 28.

At cryogenic temperatures the drift velocity of the electrons in the linear conductors will be greatly enhanced. Theoretical calculations indicate that this velocity in copper at 20° C is of the order of 3.6×10^{10} cm/sec in a current density of 480 amp/cm^2. The random velocity of free electrons in conductors is theoretically estimated at 10^8 cm/sec. At superconducting temperatures when the electrical resistance approaches zero, it is generally believed the drift velocity of electrons approaches the value of 10^8 cm/sec. This velocity is 10^{10} times greater than the velocity at 20° C. (See "Physics", Halliday and Resnick, pages 681 and 691, J. Wiley, 1962). This indicates that the intensity of the BxV field about the device, herein described, might possibly be enhanced 10^{10} times at or near the absolute zero of temperature. Hence, the invention contemplates that each of the devices described hereinafter will preferably be operated at or below the critical temperature at which the conductor used becomes superconducting. As the state of the art advances new superconducting materials will undoubtedly become available with critical temperatures very considerably above the absolute zero.

Not only dies the device that has been described in Figure 2 afford apparatus hitherto unavailable for the generation of a special distribution of the motion electric field, but it affords means for investigating the properties of this field in connection with its relation to gravity and antigravitational phenomena. In addition, it affords for the first time, a direct experimental method for determining the electron drift velocities and mobilities in linear conductors made of different materials.

When the cylindrical capacitor 26 is charged by the BxV field and its potential difference (PD) measured, it is determined by the equation

(Eq. 2) $\quad PD\ (volts) = B \times V \cdot l$

where l is the distance between the thin capacitor plates. The direct measurement of V meters/sec can then be made

(Eq. 3) $\quad V = PD\ (volts)/Bl$ m/sec

where B is in webers/m^2.

This device will exhibit an attractive force on electrically neutral matter, better defined as a differential force; i.e., the difference between a pull and push, in which the pull is greater (See reference to general theorem, p. 125, *The Mathematical Theory of Electricity and Magnetism*, by Sir James H. Jeans). The BxV field is an electrical field acting on all the elementary charges comprising the atoms of matter, electrons, protons and even neutrons, as I believe neutrons also consist of electrons and protons in close bond. The BxV force being relatively weak does not ionize the atoms of matter, but being immune to shielding, electrically polarizes them. This causes a slight elongation of some of the electrons orbits within the atoms in the direction of the field. The positive charges move slightly into the more intense region of the converging, radially directed field while the negative charges move slightly further away from the device into the weaker portion of the field. Thus the differential force between the pull and the push upon the

component parts of an atom results in the polarization of the atoms and a resultant attractive force, equivalent, I believe, to that of gravity.

A small, electrically neutral, simple pendulum 32 suspended close to one side of my device of Figure 2, about pin 34, should thus undergo a slight measurable deflection under a fairly strong BxV motional electric field. At cryogenic temperatures this force should be greatly enhanced. When the device is lying horizontally, a gravity meter placed centrally over it should give a measurable reading in milligals.

Modifications of my generator such as are shown in Figure 3 and Figure 4 show diverse methods for studying gravitational and antigravitational phenomena which the invention makes possible. Figure 3 illustrates a rectangular coil 40 made up of a single wire passed many times in the coil configuration so as to provide a large leg A preferably having a circular cross-section. However, any cross-sectional configuration would meet the objects of the invention as long as the wires are parallel to each other and closely packed. About one leg of the coil, a cylindrical shell 42, made of electrically neutral, conductive or nonconductive material, is suspended by a carrier frame 44 from one end of a sensitive beam balance 46. The beam pivots about a support bar 48 and carries a load 50 to normally counterbalance the weight of the shell 42. When a fairly strong DC current I is fed through lines 52 and is built up in the coil, the flux density B is generated in the region of the cylindrical weight whose walls are at a distance *r* from the central axis of the coil and *n* is the number of linear conductors in the coil.

(Eq. 4) $B = m_o nI/2pr$ (webers/meter^2)

If the current I is suddenly cut off the flux B will rapidly collapse. This flux in the act of collapsing should cross the walls of the suspended cylinder with a considerable inwardly directed horizontal velocity of V meters/sec. This should yield a very considerable vertical BxV in the walls of the cylinder directed wither up or down, depending on the direction of the current in the coil.

In this device the motional electric field BxV is not convergent, but is uniformly vertical, hence the pull and push exerted on the electric components of the atoms in the cylinder will be equal. In other words, the action of this field will either enhance or decrease the state of polarization already existing within the cylinder and produced by the gravitational field of the earth. If the polarization is increased, then the gravitational pull of the earth's field should be greater. If the polarization is decreased then the weight of the cylinder should be less. It is conceivable that the polarization could be reduced to zero. In this case, the object should be weightless. If the intensity of the depolarizing BxV field is still further increased, then polarization in the opposite direction to that produced by the earth's field should be achieved. In this event the earth's gravitational field would act repulsively on the cylinder. This would be antigravity in its truest sense.

The apparatus I have just been describing acts only momentarily (during the time interval in which the flux is collapsing) to change the weight of the cylinder shell 42 (shown in Figure 3).

It is desirable to have an apparatus with which to experimentally study gravitational and antigravitational phenomena under steady continuous conditions. In Figure 4 of the drawings is shown another modification of the device shown in Figure 2. Here I utilize a noninductive coil

wound in the form of a solid, low, thick-walled, hollow, right circular cylinder, and indicated generally by numeral 60. DC current is supplied through lines 62 to the coil 60. In the region directly beneath this coil disk 60 I place a similarly shaped nonferrous disk 64, suspended by a carrier 66 to the end of a beam 68. The beam 68 is pivotal about a fulcrum 70 and is counterbalanced by a load 72. For positions of disk 64 below coil 60, the BxV field can only be directed vertically upward when a continuous DC current is flowing in the wires composing the disk 60. It should be noted that this field is practically uniform and parallel close to the disk, hence it is not attractive in its action on neutral matter. Its action on such matter can only change the state of electrical polarization in the matter. Any change thus effected in the state of polarization should cause the earth's gravitational field to act less intensely on any object placed close to the under surface of the device, causing it to weigh less, become weightless, or to actually be accelerated upward by the antigravitational action of the earth's field.

Figure 5 of the drawings illustrates the manner in which the noninductive device in Figure 2 is wound with wire 22, by turning the linear conductors back on themselves through a 180° turn. Figure 6 illustrates the way the noninductive windings of the device illustrated in Figure 4 is achieved. One very long insulated wire is simply turned back on itself at its midpoint and wound double into a solid coil held together in the shape illustrated.

Figure 8 illustrates a modified embodiment of the invention which comprises a wire coil 80 either simply wound, or noninductively wound, around a hollow tube 82. Electrical current is passed to the coil 80 through wires 84, and at low temperature this coil will produce a radially, outward directed, internal BxV field from the axis 86 of the cylinder to the internal circumference 80a of the coil 80. The electrical wire making up coil 80 is preferably a ribbonlike conductor which is coated with any appropriate electrical insulation. A minimum space between adjacent turns with concentricity between adjacent turns is the preferred winding embodiment for coil 80. As many courses of turns as deemed appropriate to generate field strength will meet the objects of the invention. The tube 82 is preferable made of material having little or no magnetic permeability. Both the coil 80 and tube 82 are stationary.

An apparatus of the type illustrated in Figure 8 might be utilized to effect separation and concentration of fluids. For example, in the desalination of water, a BxV electric field generated by the passage of current through the coil 80, acts upon the disassociated ions of the sodium chloride in solution. Hence, by introducing a flwo of saline water at end 82a of tube 82, increments of fluid which are concentrated with chlorine and depleted of sodium may be drawn off through the stationary tube 90, while the increments of fluid which are concentrated with sodium and depleted of chlorine may be drawn off through the space between the exterior walls of tube 90 and the interior walls of tube 82.

Future Applications ~

This country's space projects have become expensive beyond the ability of the average man to comprehend. Achieving lift by means of costly propellants will some day be seen as akin to primitive man's use of awkward clubs as a means of exerting force. In a very short interval of time an intense BxV field should effect the reversal of the gravitational polarization of an object. Once achieved, only a very small expenditure of energy would be required to hold the polarization. Energy from the atoms of the earth would supply the lift and propulsion through the medium of the earth's gravity field. The most formidable problem would appear to be the

problem of holding the BxV generator at cryogenic temperatures. In view of the overall possibilities of this invention, this problem does not appear to be incapable of solution. A breakthrough in finding superconducting materials or even near superconducting at slightly elevated temperatures from those presently required would greatly aid in the solution of this problem.

Figure 7 of the drawings illustrates in outline, the future possible application of this device, obtaining regulated lift by an operator 71 adjusting the current into the coils 73 and 74 which incorporate the structural features of the devices of Figure 4. The antigravity gravity control features of the coils 73 and 74 thus control the lift and movement of vehicle 76. Suitable cryogenic generators 73a and 74a are associated with each of the coils 73 and 74 to provide the cooling thereof to as near absolute zero as possible to give the enhanced current passage characteristics necessary to the objects of the invention.

While I have demonstrated that AC current can be used in my device, it appears at present that DC current is much to be preferred.

This invention could be uniquely adapted to a communication system from one side of a solid barrier to the other side, whether this barrier be solid concrete or battleship armor, by pulsing the BxV generator coil with signals, Morse Code or even voice modulated signals to be picked up by a capacitor-electrometer circuit on the other side of the barrier. Secret communications could be carried on and with the electrometer circuit as shown in Figure 2 connected to a relay broadcasting unit, so that one might conceivably broadcast by radio from the interior of a solid metallic enclosure.

It is conceivable that the invention might be useful in the highly specialized art of concealed detonation devices. A detonating circuit connected to the capacitor electrometer receiving circuit of my device such as shown in Figure 2 could be actuated through a solid barrier by our BxV generating coil placed on the other side of such a barrier.

It is conceivable that for some specialized purposes, it might be highly desirable to transmit electrical power from one side of a fixed solid barrier, concrete or armor plate, etc., by pulsing, DC or AC, in our BxV coil on one side of such a barrier. A resonating LC circuit could pick up these BxV pulsations and supply a source of electrical power on the other side of the barrier, in a manner somewhat analogous to my electrical receiving methods outlined in US Patent Application, Ser. No. 803,187, identified above.

In accordance with the patent statures, only the best known embodiments of the invention have been illustrated and described in detail, but it is to be understood that the invention is not limited thereto or thereby, but that the scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for demonstrating an electrical phenomenon comprising, a coil made from an electrically conductive material having a very large plurality of sections compacted in close proximity arranged in substantially complementary relation around a common central axis, where the coil forms a solid cylindrical shape with the sections parallel to the axis thereof, and means to pass current through the coils so that about half of the sections will pass current in a

direction opposite to the other sections to cancel magnetic flux.

2. Apparatus according to claim 1 where adjacent sections are electrically insulated from each other, and the coil comprises a single wire bent back on itself to make the sections.

3. Apparatus according to claim 1 which includes means to increase the passage of current through the conductor.

4. Apparatus according to claim 3 where the means to enhance is a cryogenic generator which reduces the temperature of the conductor to or below its critical temperature at which it becomes superconductive.

5. Apparatus according to claim 1 which includes an elongated hollow tube having an axis, the conductor formed around the tube.

US Patent # 3,656,013

Apparatus for Generating Motional Electric Field

William J. Hooper

April 11, 1972
US Cl. 310/10 ~ Intl. Cl. H02k 1/00

Abstract ~

An apparatus for producing and demonstrating properties of motional electric fields by means of rotating magnetic flux produced by a plurality of magnets extending parallel with the axis of rotation, said flux of these magnets being put into rotation about a common axis by mechanical or by electromagnetic means.

Description ~

This invention relates to the generation of motionally induced electrical fields as distinct from electrostatic fields, and as distinct from the electric field (illustrated by transformer action) which is induced by the time rate of change of magnetic field induction. Hence, all reference herein to a motional electric field means the electric field that is generated by the movement of magnetic flux.

The motional electric field generated by rotational motion of magnetic flux is non-uniform in both direction and radial intensity. Particles (large or small) of matter (solid, liquid or gaseous) which are within the ambit if this motional electric field are acted upon with a force which tends to accelerate them. It is well known that a particle carrying a charge Q (coulombs) in an electric field of intensity E (Newton/coulomb) will be acted upon by a force F (Newton) given by the equation $F = EQ$. The electric intensity of E of a motional electric field is given by the vector equation E = B x V, where B is the magnetic flux density at a point in space, expressed in webers per square meter, and V is the velocity of the moving magnetic flux at that point in space, expressed in meters per second. What is not so well known, however, is the fact that a non-

uniform electric field exerts a force upon electrically neutral matter. In his celebrated text, "The Mathematical Theory of Electricity and Magnetism", Sir James H. Jeans describes, in the case of a non-uniform electrostatic field, how a "slab of dielectric will be sucked in between the plates of the condensor", thus demonstrating the mechanical force produced by such a field. He states (p. 125), "This, as will be seen later, is a particular case of a general theorem that any piece of dielectric is acted on by forces which tend to drag it from the weaker to the stronger parts of an electric field of force." According to Clerk Maxwell in "electricity and magnetism" (Vol. II, p. 181), faraday discovered that the electric field due to electromagnetic induction penetrated within and throughout all materials. The motional electric field is just such a field. Apparatus for demonstrating the "general theorem", stated by Jeans, has, in the case of the non-uniform motional electric field, not heretofore been provided.

Accordingly, it is one of the objects of the present invention to provide a device for generating a non-uniform motional electric field whose force is of magnitude such that it can be sensed.

Since the motional electric field acts within and throughout all matter, such a non-uniform field will exert a physical force on any kind of electrically neutral matter, in a manner quite analogous to that of the electrostatic field with respect to dielectric material.

Another object of the invention is to provide apparatus for obtaining useful work from a non-uniform motional electric field.

The several objectives of the invention may be accomplished by rotating an elongate magnetic field about an axis which is concentric with the field and parallel with the field's elongation. For example, an array of magnets may be mounted on a rotor so that all magnets are parallel with the axis of the rotor, and all have the same polar orientation relative to the rotor. A solenoidal electromagnet, or another array of magnets, with magnetic axis concentric with the rotational axis may also be employed to enhance the flux density of the array of magnets by flux linking with them. When such an array of magnets is rotated about the axis of the rotor, the magnetic field of each is rotated with it. As another example, an elongate magnetic field can be rotated about its axis, without mechanical movement, by provision of stationary solenoidal electromagnets arrayed like the staves of a barrel and connected to a source of multi-phase alternating current (half-wave rectified to prevent reversal of sign) in a manner comparable to the stator winding of a three-phase motor to produce "revolving field". While the composite magnetic field is thus in rotary motion, every charged, or uncharged particle of matter (solid, liquid or gaseous) within the non-uniform motional electric field thus generated in the neighborhood of the rotor, will be acted upon by a force due to the electric intensity E. Positively charged particles will be forced in the direction of the vector E, negatively charged particles will be forced in the opposite direction, and electrically neutral matter will be pulled from the weaker regions of field intensity to the stronger regions. This latter mechanical force is called a differential force due to the action of the field on the internal electrical polarization of the neutral matter.

The three vectors E, B, and V are always (with a possible exception) mutually at right angles to each other. If the thumb of the right hand is pointed in the direction of the magnetic flux density vector B, and then rotated like a right-handed screw so that it points in the direction of the velocity V of the moving magnetic flux, then the forefinger of the right hand will point in the direction of the electric vector E. The rotation of the composite magnetic flux about its axis

produces a motional electric field which will, except at the axial ends of the magnetic field, be quite generally directed radially with respect to the axis of rotation. The possible exception is in the case of a magnet having a homogenous electrically conductive core of perfectly circular cross-section, in which case the force of the electric field may be somewhat off radial.

With a given polar orientation of magnets relative to the axis of rotation, rotation of the magnetic field in a clockwise direction will generate a motionally induced electric field of sign (positive or negative) opposite that which is generated when the rotation is counterclockwise. For any given sense of rotation, reversing the polar orientation of the magnets relative to the axis of rotation likewise reverses the sign (positive or negative) of the motionally induced electric field. Reversing both the direction of rotation and the polar orientation of the magnets (a situation exemplified by viewing the apparatus first from one axial end, and secondly from the opposite axial end) produces no change in sign (positive or negative) of the motionally induced electric field.

In the accompanying drawings, three embodiments of the invention are exemplified. Also, there are two model schematics to illustrate in its simplest form the principle of the invention, in which a plurality of commonplace permanent magnets are mounted upon a rotor.

The first embodiment is one in which an array of electromagnets is mounted on a rotor having a hollow center, through which particles of matter can be moved and their response to the motional electric field perceptibly demonstrated.

Second, there is an embodiment in which a pair of oppositely rotating rotors, nested one within the other, are each provided, on its circumference, with an array of electromagnets oriented as aforesaid on each rotor, but oppositely oriented on the respective rotors, and wherein the effect of the motionally induced electric fields can be perceptibly demonstrated by the behavior of particles of matter externally to the rotor.

In the accompanying drawings:

Figure 1 is a diagrammatic view illustrating the effect of rotating an array of spaced permanent magnets about an axis which is parallel with each of the magnets when all magnets have corresponding polar orientation.

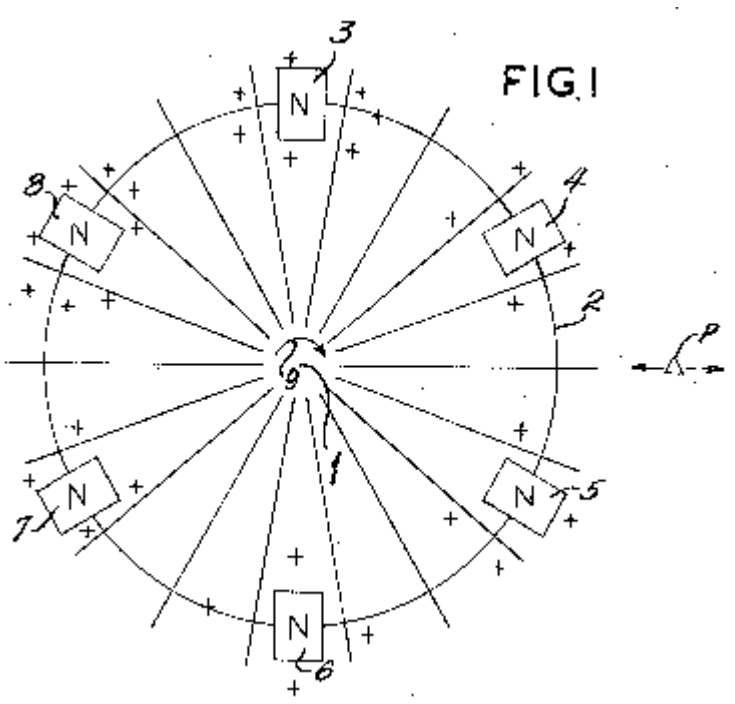


Figure 2 is a diagrammatic view representing a side elevation of the arrangement shown in Figure 1, and illustrating the external magnetic flux paths of the several permanent magnets;

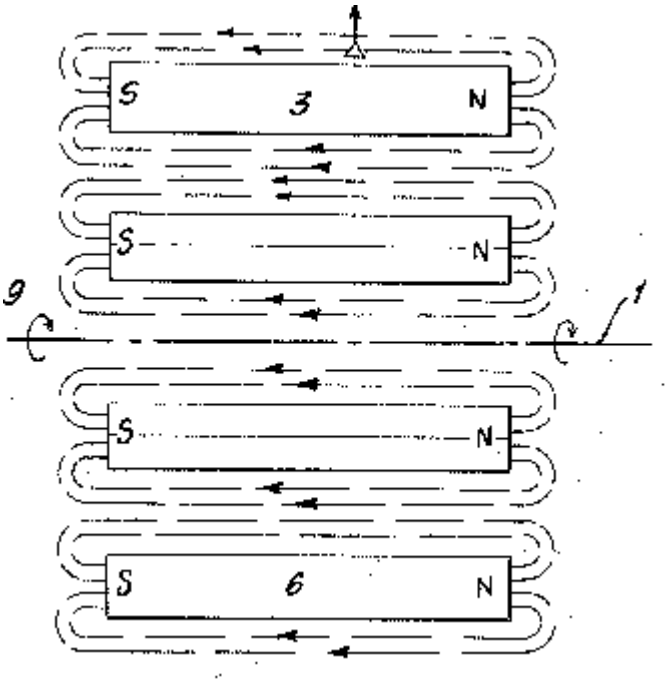


Figure 3 is a perspective view of a rotor for generating a radially directed motional electric field in accordance with one embodiment of the invention, wherein electromagnets are arrayed within a hollow rotor with axes parallel to that of the rotor;

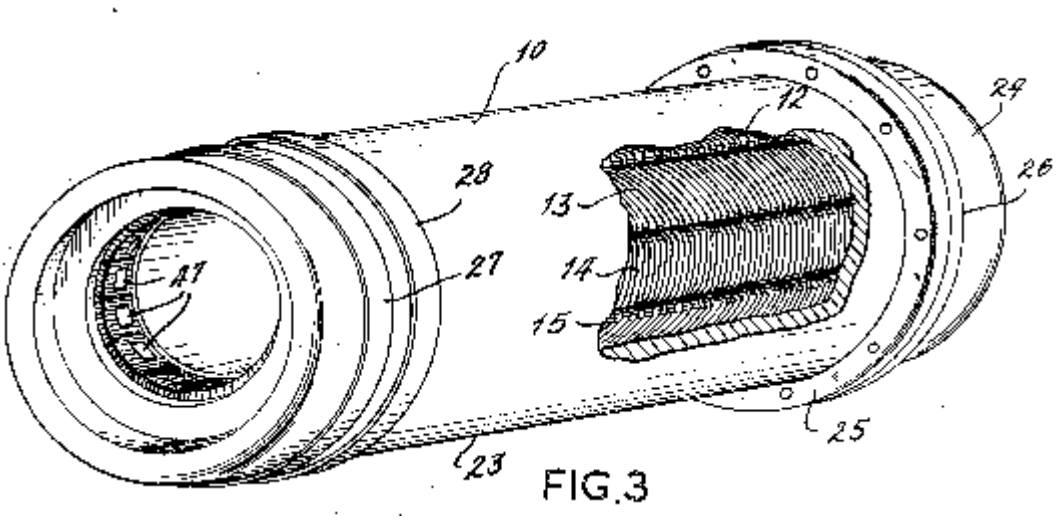


FIG.3

Figure 4 is a sectional view taken along a diametric plane of the rotor shown in Figure 3, together with it cooperating parts;

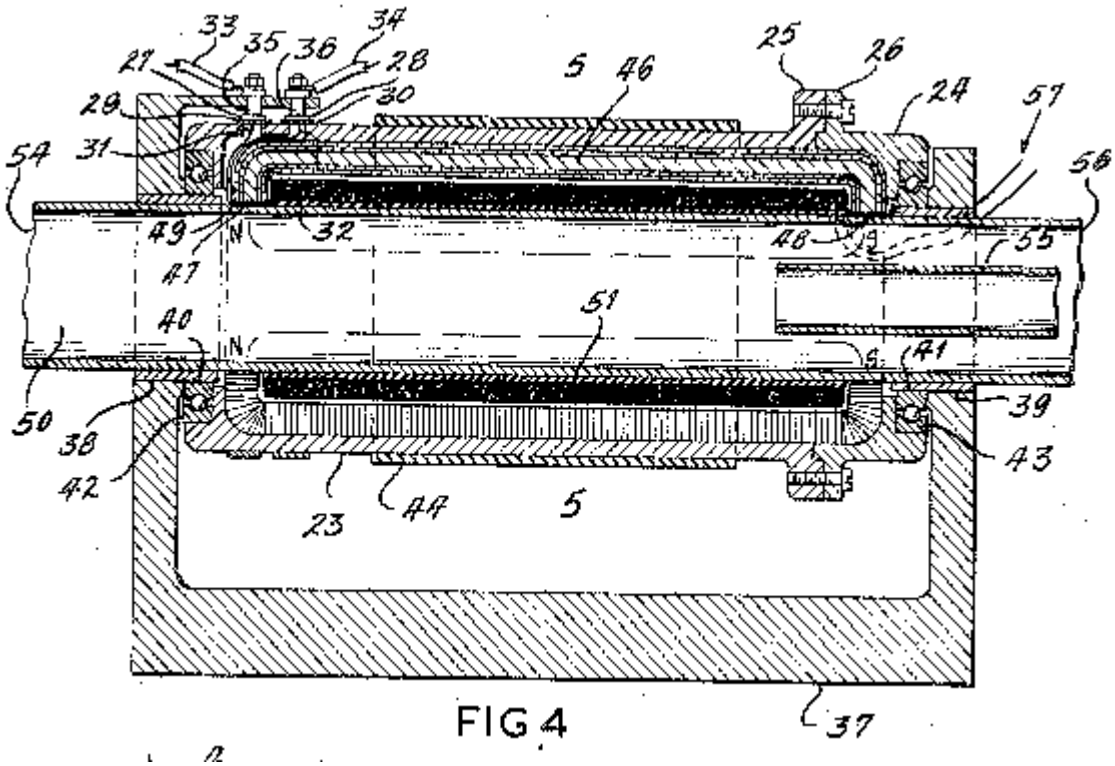


FIG.4

Figure 5 is a sectional view along line 5-5 of Figure 4, and showing, in addition, driving means of the rotor;

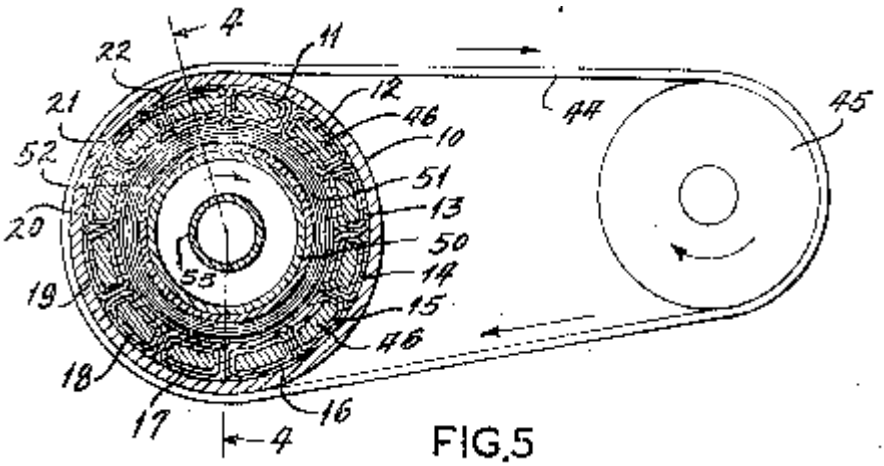


FIG.5

Figure 6 is a sectional view taken along a diametric plane of a stationary form of apparatus similar to that shown in Figures 3,4, and 5, but wherein the magnetic flux field is rotated electromagnetically by phase displacement;

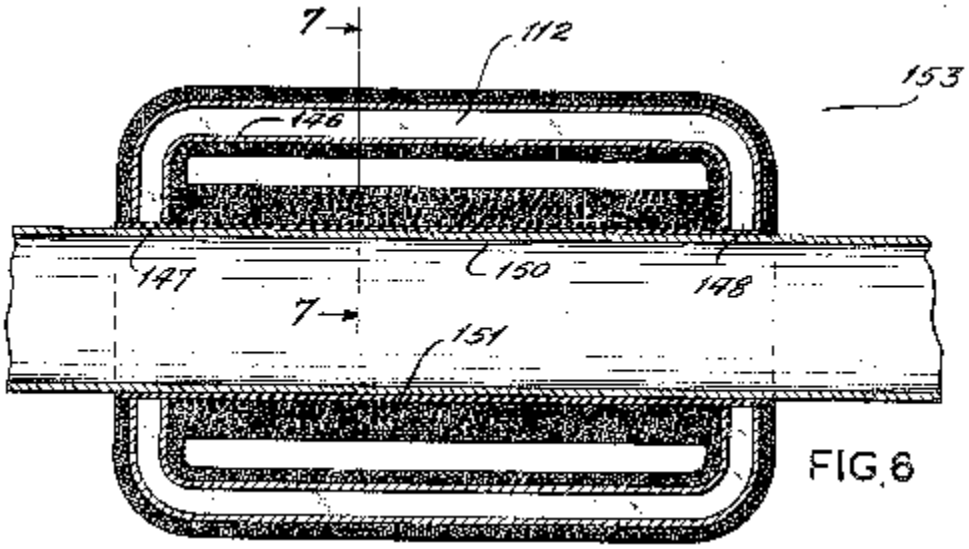


FIG.6

Figure 7 is a sectional view taken along line 7-7 of Figure 6;

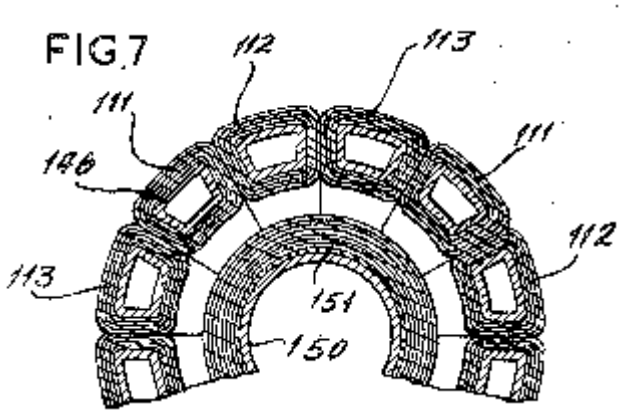


Figure 8 is a wiring diagram for the apparatus shown in Figures 6 and 7.

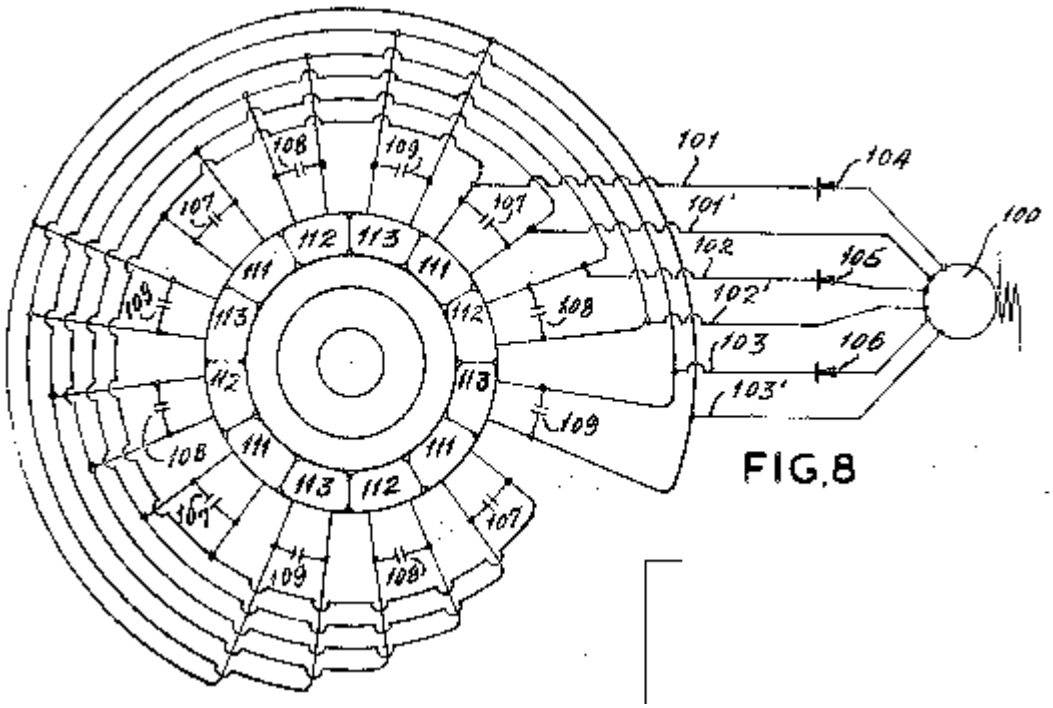


Figure 9 is a longitudinal sectional view of an apparatus having a plurality of rotors for generating a BxV electric field;

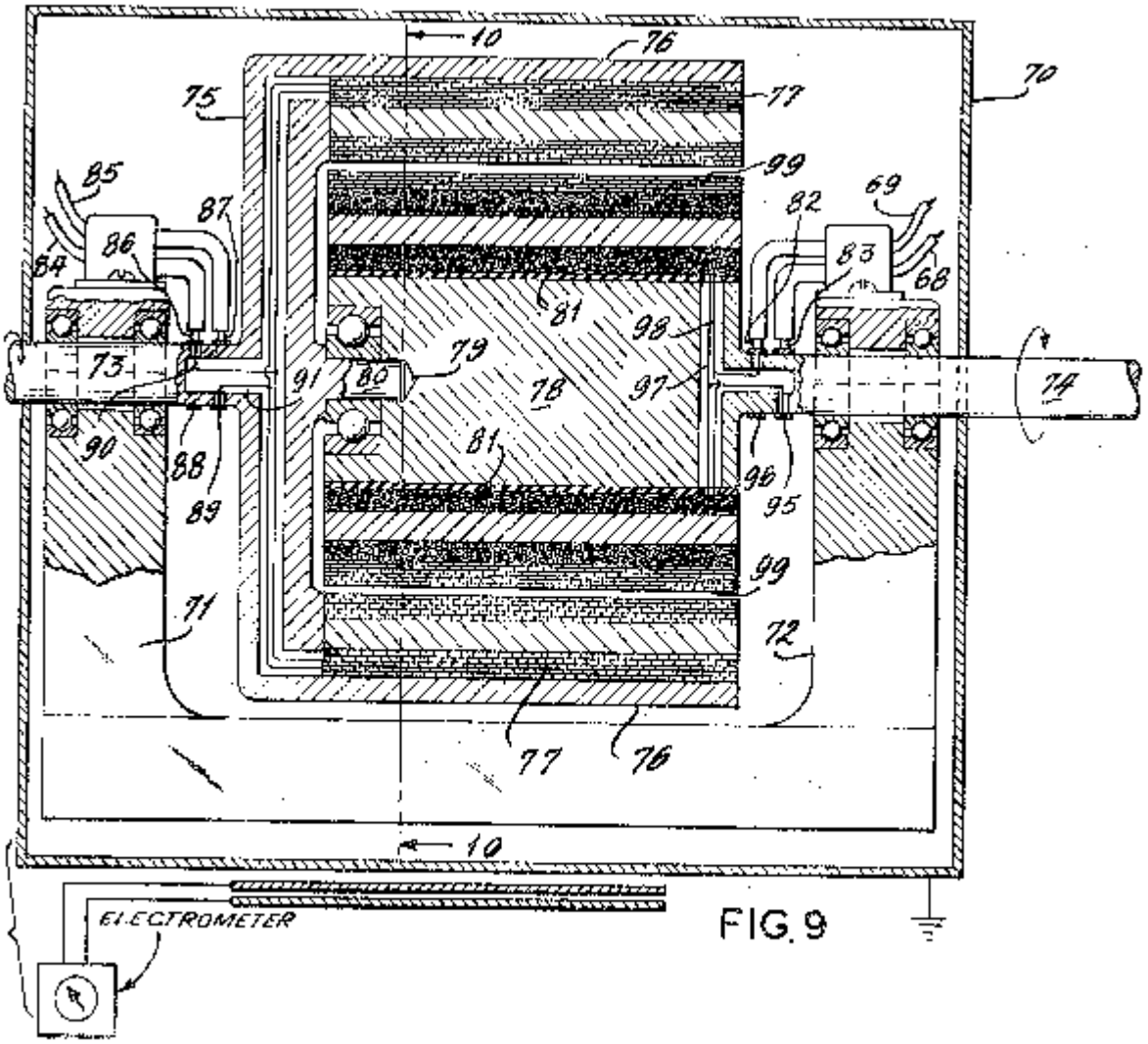


Figure 10 is a sectional view taken along line 10-10 of Figure 9, and

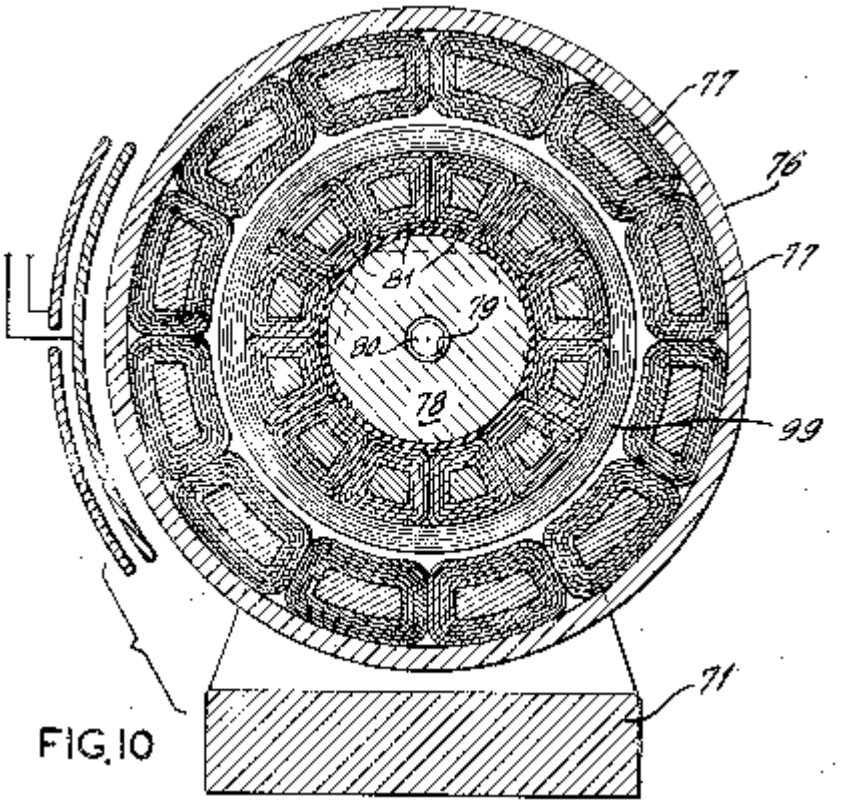
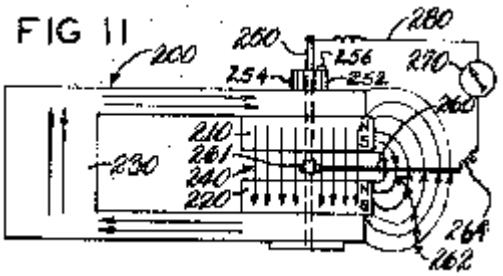


Figure 11 is a diagrammatic illustration of an apparatus for exhibiting moving field phenomena.



In Figure 1 and Figure 2, the principle of the invention is diagrammatically illustrated with the utmost simplicity, wherein a catena f magnetic flux fields, all with the same polar orientation, is produced by arranging an array of rod-type permanent magnets parallel with each other, and parallel with the axis about which they are to be rotated. In Figure 1, the axis of rotation is designated 1, and may be considered as the center of a shaft of a rotor, preferably composed of material having low, if any, magnetic permeability, and low, if any, electrical conductivity. The periphery of such a rotor is designated by the circle 2. In the form shown, a series of permanent magnets 3, 4, 5, 6, 7, and 8 is appropriately secured to the periphery of the rotor with the respective magnets in equi-spaced relationship, and all with their north poles addressed in the same direction which, as shown in Figure 1, is in the direction of the reader or, as shown in Figure 2, to the reader's right. The external flux fields from the respective permanent magnets 3, 4, 5, and 6 are illustrated in Figure 2, where it will be observed that the external flux path of all magnets is from right to left, a relationship designated by the plus (+) marks in Figure 1. With such an arrangement, the flux fields of all magnets may be concurrently rotated about axis 1.

Considering the rotation to be in the direction of arrows 9 and the polar attraction of the several permanent magnets to be as illustrated, a BxV motional electric field will be generated both externally and internally of rotor periphery 2 upon rotation of the rotor. The thus generated motional electric field will exert a radially directed force upon every particle of matter, neutral or charged, such a particle P, which is within the ambit of the catena of magnetic flux fields. The magnitude of the so impressed electric field intensity will depend upon the magnetic flux concentration at the particle P and the relative velocity between the flux field and the particle P. While, if particle P is in motion, its velocity must be considered in arriving at the relative velocity V (in the formula E = B x V) the disclosure will be simplified if the particle P be considered as stationary, and in such event V will be 2 R times S, where R is the radial displacement of particle P from axis 1, and where S is the revolutions per unit of time made by the rotor. Hence, with the particle P stationary, the magnitude of the force impressed upon it is increased when the speed of rotation of the rotor is increased at a given flux density; and is increased by an increase in the flux density at a given speed of rotation. The direction in which the force of the motionally induced electric field acts upon particle P is always perpendicular to the magnetic flux field B and to its velocity V. The sign of the electric field may be either positive (acting radially outward from the axis of rotation) or negative (acting radially inward toward the axis of rotation), which, for any given polar orientation shown in Figure 1 and Figure 2, may be reversed by reversing the direction of rotation of the rotor. With the polar orientation shown in Figure 1 and Figure 2, and the direction of rotation indicated by arrow 9, if particle P is a proton or a positively charged molecule, the force of the B x V electric field will be radially inward as indicated by the solid line arrow attached to particle P; but if particle P is an electron or a negatively charged molecule, the particle will tend to move radially outward as shown by the broken line arrow; and if the particle P is electrically neutral, it will tend to move in the direction of increasing electrical intensity E. Increase of E requires either that both B and V be increasing or that one be increasing at a sufficiently greater rate than the other is decreasing so that the product (BxV) increases. In the relationship of field and particle shown in Figure 1, the product (BxV) increases radially inward.

For practical purposes, however, commonplace permanent magnets produce insufficient flux density in their external flux paths to impress upon a particle of charged matter such as P, an electric force of sufficient magnitude that the force of the electric field can be measured with ease, at least at speed of rotation within practical limits. Consequently, the practical embodiments of the invention, later to be described, make use of electromagnets of a form capable of producing external flux densities of vastly greater flux density B, as well as higher velocities V.

The term "unipolar induction" has been used to indicate the induction of an electric field in the vicinity of an axially symmetrical magnetic system rotating about its axis of symmetry. There has been disagreement about whether as the magnetic system is rotated the lines of magnetic induction are carried with it or remain stationary while the magnetic system rotates through them. For example, when a bar magnet is rotated about its magnetic axis, it is believed by many that the magnetic field is stationary. I have demonstrated that under certain conditions, at least, the magnetic lines can be made to move, and I have devised certain methods and apparatus for utilizing this phenomenon as in the production of localized and high intensity electric fields.

Turning now to Figure 11 of the drawings, an apparatus for demonstrating certain magnetic phenomena is illustrated in diagrammatic form. A magnetic system, indicated generally by

numeral 200, includes a pair of permanent magnets 210 and 220 which are axially magnetized and mounted in axial alignment between the ends of a U-shaped yoke 230 of highly permeable magnetic material. The adjacent surfaces of magnets 210 and 220 being of opposed polarity are spaced apart, providing an air gap 240 therebetween. The lines of magnetic flux are shown in the drawing and indicated generally by numeral 262. A brass rod 250 extends axially through magnets 210 and 220. The magnetic system 200 is rotatable about rod 250. A stiff conductor 260 is electrically connected by a collar 261 at one end in rotatable or fixed relation as selectively desired, with the brass rod 250 at a point in the gap 240 between magnets 210 and 220. The other end of conductor 260 extends substantially perpendicularly from rod 250 to a distance in space away from the magnets and yoke where the magnetic field falls to approximately zero intensity. In order to complete an electrical circuit through galvanometer 270 and conductor 280 to the brass rod 250 and conductor 260, a flexible and extensible electrical wire 264 connects the end of conductor 260 to the galvanometer 270. A gear 252 locked alternatively by set screw 254 to rod 250 or by set screw 256 to yoke 230 can serve to provide driving motion to either the rod 250 or by set screw 256 to yoke 230 as selectively desired. Normally, for the purposes of the experiment, the driving motion will be reciprocal because of the connection of wires 280 and 264.

With this apparatus, if the magnetic system 200 is held fixed and a given angular displacement imparted to conductor 260 by rotating it horizontally about or with rod 250 through the air gap at a given angular speed, a voltage is induced which provides a deflection of galvanometer 270. Furthermore, when the conductor 260 is held fixed and the magnetic system 200 rotated through the same angular displacement about rod 250, at the same given angular speed, a similar voltage of exactly the same magnitude but opposite direction is induced in the galvanometer circuit. The same deflection is obtained whether or not the magnets 210 and 220 rotate with the yoke 230 or are held stationary while the yoke alone is rotated. This indicates clearly that the lines of magnetic induction in the quantity rotate about the axis of rotation 250 as if they were rigidly attached to the magnetic system 200.

A most important aspect of the operation of the apparatus of Figure 11 is noted when the magnets 210 and 220 are held fixed in relation to the conductor 260 and rod 250 and the yoke 230 is rotated about the rod 250. This action causes induction of current in the galvanometer circuit exactly as occurs when the entire magnetic structure exactly as occurs when the entire magnetic structure or the conductor itself are moved. However, if the magnetic yoke 230 and conductor 260 are held fixed and magnets 210 and 220 rotated, there is no deflection of the galvanometer. Thus, it appears that the yoke structure plays an important part in controlling movement of the magnetic flux. Furthermore, it should be noted that the magnetic flux does not link the galvanometer circuit in the usual sense that this term is used, but that a current is induced in the galvanometer circuit through the action of the conductor 260 in merely cutting across the field extending between adjacent faces of magnets 210 and 220.

It has also been found that the permanent magnets 210 and 220 may be replaced by an electromagnet and the results described above duplicated. Furthermore, it can be demonstrated that the magnetic flux within the air core of a solenoid may be rotated about its magnetic axis. A brass tube formed in the shape of a toroidal C has a winding applied to its entire length with holes drilled in the tubing to receive a bras rod, as 250 in the structure shown in Figure 11. With the winding energized, the above-described procedures produce similar galvanometer

deflections.

This application is concerned with certain methods and apparatus which make use of the phenomena described above.

Referring now to Figure 3, Figure 4, and Figure 5 for an illustration of the second embodiment, a tubular rotor 10 is provided on its inner periphery with 12 keystone cross-sectional electromagnets 11, 12, 13, 14, 14, 16, 17, 18, 19, s0, 21, and 22 of the solenoid type. As seen in the cross-section of Figure 5, the several electromagnets are arranged as sectors of a cylindrical annulus. While in the form shown, the several electromagnets 11-22 are shown in circumferentially wedged relationship, whereby to minimize the likelihood of relative movement radially inward as at standstill, as well as in the interest of achieving substantial uniformity of external flux density throughout the inside circular area of the rotor, it will be understood that when and if desired, the several electromagnets can be circumferentially spaced one from the other, and, if desired, a space of relatively low, if any, magnetic permeability may be interposed between them. Any suitable means may be employed for securing the several electromagnets to the shell of the rotor.

In order to facilitate the assembly of the several key-shaped electromagnets on the interior of the rotor as shown, the shell thereof is made of at least two pieces 23 and 24. In the form shown in Figures 3-5, the two pieces 23 and 24 are cup-shaped, and are respectively provided with outwardly extending flanges 25 and 26. Once the several solenoids have been positioned within the longer shell piece 23, the shorter shell piece 24 may be applied as a cap so that flanges 25 and 26 abut, and may be appropriately secured together as by riveting, bolting, welding, or cementing.

The shell pieces 23 and 24, a well as their interconnecting means, may be formed of material having little or no magnetic permeability, or in cases where it is desired to shield the exterior from the escape of magnetic flux, they may be formed of material having a high magnetic permeability. Instead of dividing the rotor shell in twain axially, it may be divided in twain radially, in which event the two halves will have axially extending joints when assembled and may be held in such assembled position by banding or other appropriate means capable of sustaining the centrifugal force to which the rotor will be subject in use.

At the end of shell piece 23, remote from flange 25, there is provided a pair of slip rings 27 and 28 which, in the event the shell piece is formed of electrically conductive material, may be separated from the shell piece by sub-rings 29 and 30, of appropriate insulating material. The slip ring 27 is connected through a conductor 31 to the free end on the inner course of the solenoid winding for each of the electromagnets 11-22. The slip ring 28 is connected through a conductor 32 to the free end of the outer course of winding in each of the solenoids 11-22. All 12 solenoids are connected so that the direction of electric current flow is the same in all solenoids. The energizing current is supplied from an external source through conductors 33 and 34 and brushes 35 and 36, in a manner well understood in the art.

The rotor is mounted upon an appropriate frame 37, having opposite stationary stub axles in the form of ferrules 38 and 39 which project toward each other. On the projecting portion of each of ferrules 38 and 39, there is provided an inner race 40 and 41 for each of two ball bearing sets whose outer races 42 and 43 are appropriately mounted to the respective ends of the rotor 10, so

that the rotor 10 is free-running, with respect to the frame 37, about an axis concentric with the rotor 10.

In the embodiment shown, the exterior cylindrical surface of rotor 10 serves as a pulley for a drive belt 44 which connects the rotor to a source of power 45, but any other suitable mean of driving the rotor in rotation may be utilized.

In the form shown in Figures 3-5, the apparatus is intended to concentrate the magnetic flux of the several solenoids radially inward, and to facilitate this each of the solenoids is provided with a core 46 of material having high magnetic permeability. As shown in Figure 4, the several cores 46 are of squat U-shape, and extend, for the most part, parallel to the axis of the rotor, but at each end the cores are curved so as to provide faces 47 and 48 addressed radially inward. To minimize the radially outward escape of magnetic flux from the several solenoids, they are preferably wound of ribbon-like conductor which is coated with any appropriate electrical insulation. The first course of winding begins at 49, and proceeds in helically wound fashion with the minimum of space between adjacent turns about core 46, to the opposite end thereof, whereupon, without interrupting the continuity of the conductor, the second course is wound helically over the first course, with the pitch of the helix reversed from that in the first course. In this way, any gaps between successive turns in the first course are overlapped by turns in the second course. While the drawings show only two courses of conductor about each core 46, it will be understood that, in practice, there may be many more courses.

With the several solenoids connected through the slip rings to a source of direct current as above-described, it will be understood that all the solenoids 11-22 have the same polar orientation with respect to the axis of rotation of the rotor. For example, all core ends 47 are North poles, and all core ends 48 are South poles.

A tube 50 of circular cross-section is mounted in fixed relationship within the respective ferrules 38 and 39. The tube 50 is preferably made of material having little or no magnetic permeability. The tube 50 is stationary, but the rotor rotates about the axis of the tube 50.

A stationary solenoid 51 is fixedly mounted on the exterior of tube 50 in a position such as to fit, with clearance, into the bight of the squat U-shaped solenoids 11-22. Solenoid 51 may be wound directly on tube 50, but in the form shown, it is wound on a cylindrical core 52 of material having little or no magnetic permeability, and the core 52 is telescoped on tube 50. The stationary solenoid 51 is energized through appropriate leads (not shown) from conductors 33 and 34 or other source of direct current, and is so connected that its magnetic polarity is opposite that of solenoids 11-22, that is to say that when, as aforesaid, the core ends 47 are North poles, the adjacent end of solenoid 51 will be its South pole. Thus, the magnetic flux of solenoids 11-22 has an external path, through tube 50, which is coincident with, and in the same direction as, the internal path of magnetic flux in solenoid 51.

Thus, the magnetic field generated by each of the solenoids 11 through 22, as well as that generated by solenoid 51, penetrates the interior of tube 50, and when the rotor is driven in rotation, those magnetic fields rotate collectively about the axis of tube 50. During each rotation, particles of matter within the tube 50 are within the motional electric field generated by the rotating magnetic flux. Such an apparatus has a demonstrable effect in the separation and concentration of fluids. For example, in the desalination of water, the BxV electric field

generated by the rotating magnetic fields, acts upon the disassociated ions of sodium chloride in solution. This is explained by the fact that if the rotor 10 be rotated in the direction shown by the arrows in Figure 5, the BxV field tends to drive the positively charged sodium cations toward the center, and tends to drive the negatively charged chlorine anions away from the center of tube 50. Hence, by introducing a flow of saline water at end 54 of tube 50, and by providing a concentric separating tube 55 at end 56 of tube 50, increments of fluid which are concentrated with sodium and depleted if chlorine may be drawn off through the stationary tube 55, while the increments of fluid which are concentrated with chlorine and depleted of sodium may be drawn of through the space between the exterior walls of tube 55 and the interior walls of tube 50.

Another utility of the apparatus shown is that of transmuting hydrogen into helium, in which event tube 55 is omitted and electrodes are provided at opposite ends 54 and 56 of tube 50, so that an electric arc may be established between them. Heretofore, difficulty has been encountered in maintaining the plasma of the arc in a relatively straight path between the electrodes as it tends to wiggle and extinguish itself when it makes contact with one of the confining walls. However, by impressing a BxV electric field upon such an arc, its path may be confined within controllable limits. The BxV electric field has the further effect of driving hydrogen protons toward the center of the tube, and driving electrons away from the center of the tube. Add one neutron to a hydrogen atom nucleus, and there is produced the isotope known as Dueterium; add one more neutron to the Dueterium nucleus, and it becomes tritium; add one more proton to the Tritium nucleus and it becomes Helium.

A third embodiment of the apparatus is shown in Figure 6, Figure 7, and Figure 8. With the significant exception that the embodiment of Figures 6, 7, and 8 has no moving parts, its organization is, in general, quite similar to that shown in Figure 4 and Figure 5, and hence the last two digits of the reference characters utilized in the previous embodiment. As shown in Figure 6, a cylindrical tube 150 has a solenoid 151 wound on the exterior thereof, and is energized with direct current from a suitable source through leads 153. A plurality of squat U-shaped solenoids 111, 112, and 113, of keystone-shaped cross-section, of which there are four each or any multiple of four, are wound as described in connection with the previous embodiment, and securely mounted in any suitable way with their pole faces 147 and 148 contiguous with, and addressed toward the axis of, tube 150. In this embodiment, however, the several squat U-shaped solenoids 111, 112, and 113, have cores which are made of material having little or no magnetic permeability, such as tubes 146 of paperboard wound to a keystone shape with hollow interior. As in the previous embodiment, the magnetic polarity of solenoid 151 is opposite that of the solenoids 111, 112, and 113, which is to say that if ends 147 of the solenoids 111-113 are the North poles thereof, the adjacent end of solenoid 151 is its South pole, so that the external magnetic flux path from solenoids 111-113 is coincident with, and in the same direction as, the internal flux path of solenoid 151.

In the embodiment shown in Figures 6-8, the several squat U-shaped solenoids 111, 112, and 113 are energized with non-interconnected three-phase alternating current, each phase of which has been half-wave rectified to produce direct current pulsating at alternate half cycles. One phase of the alternating current is connected to all solenoids 112; and the third phase of the alternating current is connected to all solenoids 113, as shown in the wiring diagram of Figure 8, where a three-phase alternator 100 is provided with six leads arranged I three pairs, to wit: leads 101 and 101' for the first phase, leads 102 and 102' for the second phase, leads 103 and 103' for the third phase. The respective phases are not electrically interconnected. In each of leads 101, 102, and

103, there is a rectifier 104, 105, and 106, respectively. Leads 101 and 101' serve all four of solenoids 111; leads 102 and 102' serve all four of solenoids 112; and leads 103 and 103' serve all four of solenoids 113. Across leads 101 and 101', between the rectifier 104 and the respective solenoids 111, there is provided a capacitor 107. Such capacitor is to coordinate the capacity and inductance of input, and to neutralize the effect of induction in solenoids 111 by adjacent solenoids during the off half-cycle of energization. Likewise, a capacitor 108 is connected between leads 103 and 103'. It will be apparent to those skilled in the art that since the four solenoids of like phase are arranged in quadrature with each other, and since solenoids 111 will reach their peak of magnetic flux, and the latter 120 degrees ahead of solenoids 113 reaching their peak flux, a revolving magnetic field is created. Due to the rectification of the alternating current, and the consequent utilization of the half cycles which all flow in the same direction, there will be no reversal of the direction of magnetic flux generated by any of solenoids 111, 112, and 113, and hence, as in the case of the previous embodiment, the external path of all magnetic flux generated in the solenoids 111, 112, and 113 is coincident with, and in the same direction as, the internal flux generated by direct current energization of solenoid 151. When such an arrangement is supplied with alternating current at high frequency, such as a thousand cycles per second, the same results are achievable with this embodiment as with the previous embodiment but without any mechanical parts.

For the purpose of illustrating the effect of the BxV electric field, and segregating that effect from the effect of stray magnetic and electrostatic forces, reference may be had to Figure 9 and Figure 10. The device there sown is intended to be encased in an electrically grounded box 70 of material which has a high magnetic permeability, and which also has the property of electrical conductivity for shielding electrostatic fields.

Within the box 70,there is a compound rotor machine, wherein the respective rotors are driven in opposite directions. In a suitable frame having spaced pedestals 71 and 72, there is mounted a shaft 73 and an independent shaft 74.Both shafts 73 and 74 may be driven at the same rotational speed, but in opposite senses. A yoke 75 is fixedly mounted to shaft 73 for rotation with it. The yoke is cup-shaped with cylindrical skirt 76. About the inner periphery of skirt 76, a plurality of solenoidal electromagnets 77 are fixedly mounted thereto. The several electromagnets extend parallel with the common axis of rotation of shafts 73 and 74, and are of the same polar orientation with respect to those shafts. The several electro magnets 77 have identical solenoids wound, in the same manner previously described, about identical cores of material having high magnetic permeability. The solenoids of the several electromagnets 77 are energized from a suitable source of direct current through conductors 84 and 85,brushes 86 and 87, slip rings 88 and 89, and conductors 90 and 91. The respective solenoids 76 and 76 are preferably connected in parallel circuit relationship, but if desired, may be in series so long as uniform polar orientation is maintained.

Shaft 74 is provided with a hub 78 having a coaxial bore 79, into which is rotatably fitted a pilot 80 projecting concentrically from shaft 73. On the outer periphery of hub 78, there is mounted a plurality of electromagnets 81, each of which is an identical solenoid, and each of which has an identical core of material having high magnetic permeability. As in the previous case, the several solenoids 81 are all energized so as to have the same polar orientation with respect to their axis of rotation. Each of the solenoids is energized from a suitable source of direct current through conductors 68 and 69, brushes 82 and 83, slip rings 95 and 96, and conductors 97 and 98. All of the solenoids 81 are preferably connected in series circuit relationship, but if desired, may be in

parallel.

If desired, and as shown, the several solenoids 81 may be surrounded by a simple solenoid 99 wound helically thereabout and electrically connected in parallel or series relationship with solenoids 81 and to conductors 97-98 so that the current flow through solenoid 99 is in the same direction as through solenoids 81. Thus the winding 99 serves the dual purpose of boosting the magnetic fields generated by solenoids 81 and of mechanically binding the later to the surface of hub 78.

When, as contemplated, the shafts 73 and 74 are driven in rotation simultaneously, but in opposite directions, the solenoids 77 which rotate with shaft 73 have opposite magnetic polar orientation to those (81) which rotate with shaft 74. The several solenoids 77 are preferably designed to create external magnetic flux fields of flux density approximately equal and opposite to those created by electromagnets 81 and 99, but with the principle of superposition ("Elec. & Magn.", by Ralph W. Winch, 1963 Ed., p. 202), each flux field acts as if the other were not present. Despite the fact that the flux fields created by the responsive series of electromagnets 77 and 81 and 89 are oppositely directed, since their rotation is in opposite senses, their resultant effect, insofar as concerns the generation of a BxV electric field, is cumulative. Accordingly, the external BxV electric field is intensified at the exterior of the device, and its effect on the outside of shielding box 70 is demonstrable, even though the resultant magnetic flux density there is approximately zero. Such demonstration might be through a capacitor and electrometer as shown in Figure 9, for example.

In order to achieve the maximum flux density and hence the maximum BxV electric field density, it is desirable to take measures which keep the apparatus cool. This may involve resort to such means as: winding the several solenoids with so-called "super-conductors" such as that known commercially as "Supercon"; or refrigerating the apparatus as by immersing it in a bath of liquid helium which is capable of maintaining a temperature of approximately 4 degrees Absolute.

While several illustrative embodiments of the invention have been disclosed in detail, it is not to be understood that the invention is limited to those embodiments. On the contrary, the principles of the invention are susceptible of application I a vast variety of forms with0out departing from the spirit of the invention or the scope of the appended claims. The apparatus defined in the following claims is believed by the applicant to demonstrate his unique theory disclosed above.

What is claimed is:

(1) An apparatus or generating an electric field, comprising: a frame; a cylindrical rotor; a shaft journalled on the frame and supporting the rotor for rotation about its longitudinal axis; a plurality of electromagnets, each of which is an identical solenoid having a core formed of a material having a high magnetic permeability, the electromagnets being fixedly mounted on the rotor with each electromagnet extending parallel to the axis of rotation thereof, means to energize the solenoids of the electromagnets from a direct current source, the solenoids being energized so as to maintain a uniform polar orientation; and an enclosure surrounding the frame and the rotor, the enclosure being formed of an electrically conductive material the enclosure being grounded.

(2) Apparatus according to claim 1 wherein the rotor is a hollow cylindrical rotor, the electromagnets being affixed to the inner cylindrical surface of the rotor.

(3) Apparatus according to claim 1 wherein the solenoids are connected in parallel circuit relationship.

(4) Apparatus for demonstrating magnetic phenomena comprising: a frame; a cylindrical rotor; a shaft journalled on the frame and supporting the rotor for rotation about its longitudinal axis; a plurality of electromagnets, each of which is an identical solenoid having a core formed of a material having a high magnetic permeability, the electromagnets being fixedly mounted on the rotor with each electromagnet extending parallel to the axis of rotation thereof, means to energize the solenoids of the electromagnets from a direct current source, the solenoids being energized so as to maintain a uniform polar orientation; and enclosure surrounding the frame and the rotor, the enclosure being formed of an electrically conductive material, the enclosure being grounded; and means surrounding at least a portion of the enclosure to detect and measure the electric field generated during rotation of the energized rotor.

(5) Apparatus for demonstrating magnetic phenomena, comprising: a U-shaped yoke of highly permeable magnetic material; a pair of permanent magnets mounted in axial alignment between the ends of the yoke, one magnet being mounted to each leg of the yoke; an electrically conductive non-magnetic rod extending axially through the magnets; a stiff conductor mounted at one end to the rod for rotation relative to the yoke in a plane perpendicular to the rod and intermediate the magnets, the conductor extending a sufficient distance beyond the magnets so that its other end is located at a point where the magnetic field from the magnets falls to approximately zero intensity; a galvanometer; and circuit means connecting the ends of the conductor to the galvanometer to measure current flow through the conductor.

(6) Apparatus according to claim 5 wherein the magnets are rotatably mounted to the yoke for rotation about the axis of the rod, and where the magnets are axially magnetized and adjacent faces are of opposite polarity.

Similarities of the Motional Electric & Gravitational Forces

William J. Hooper
Professor Emeritus, Principia College
President & Director of Research, Electrodynamic Gravity, Inc.
P.O. Box 1976, Sarasota, FL

Abstract
That the magnetic °ux surrounding a current-carrying linear conductor moves with the electron drift velocity is demonstrated in a motional ¯eld out into the surrounding space. This ¯eld is not electrostatic. It is immune to shielding. Magnetic °ux has been eliminated. The presence of this unique, special electric ¯eld is detectable and its intensity is measurable with an electrometer. From such measurements, electron drift velocities can be directly determined. The unique properties of this ¯eld strongly suggest its equivalence to the gravitational ¯eld. If equivalence proves to be a fact, then direct absorption of gravitational ¯eld energy becomes possible for electric power without pollution. If generation in great intensity becomes possible, theory indicates that the concepts of arti¯cial gravity is space vehicles, weightlessness in limited earthly laboratories, and even anti-gravity, or lift instead of pull from the earth's gravity, have possibilities of attainment.

Introduction

How can a force like gravity originate and emanate from atoms of matter made up primarily of three elementary particles | electrons, protons and neutrons? Einstein wrote, "It would be a great step forward if we succeeded in combining the gravitational ¯eld and the electromagnetic ¯eld into a single structure" (1). A very considerable step in this direction may have been made by the advent of the recently invented motional electric ¯eld generator and the newly revealed properties of this ¯eld. (2)

When magnetic °ux is moved perpendicularly across a conductor, we say that an emf is electromagnetically induced within the conductor. This phenomenon has been little thought of as involving the production of a spacially distributed electric ¯eld. It arises from the operation called °ux-cutting; wherein the electric ¯eld is motionally induced within the space occupied by the moving magnetic °ux, and is present therein, whether a conductor is present in this space or not. Correctly de¯ned, we can say that when magnetic °ux of vector intensity B is moved across a region of space with vector velocity V , an electromagnetically induced electric ¯eld of vector intensity $B£V$ makes its appearance in this space, at right angles to both B and V . For short, this induced ¯eld is called a motional electric ¯eld. A study of its properties is exciting.

Clerk Maxwell wrote in his description of the work of Michael Faraday that the intensity of the induced electric ¯eld "is entirely independent of the nature of the substance in which it acts" (3).

The origin of this ¯eld, being electromagnetic induction, and non-electrostatic in nature, gives this ¯eld its penetrating nature which enables it to be present within either magnetic or non-magnetic conductors or insulators, entirely independent of the nature of the substance. The writer's extended experiments (4) involving shielding con¯rms Maxwell's description of this ¯eld.

The Motional Electric Field Generator

The motional electric ¯eld generator was designed and built to provide a device which would project a pure motionally induced electric ¯eld into the space surrounding it, devoid of electrostatic and magnetic accompaniments. It involves a newly discovered, non-mechanical method for moving magnetic °ux, combined with one of the most basic and orthodox laws of physics, "the principle of superposition of ¯elds". This principle states that in order to ¯nd the resultant intensity of the superimposed ¯elds, each ¯eld should be treated as though the other is absent. The resultant is obtained by the vector addition of each ¯eld considered singly.

In 1820, Hans Christian Oersted discovered that a current-carrying conductor has magnetic

°ux looped about it. This discovery served to unify the then separate sciences of electricity and
magnetism. In 1957, B.G. Cullwick (5), in a careful, thought-provoking analysis of moving charges,
set forth three documented experimental fats to support the idea that the Oersted °ux around a
moving conduction electron should move with it. The writer had independently been led to the
same conclusion. A plan for experimentally investigating this phenomenon was evolved. The de-
sign of the motional electric ¯eld generator was the result, and its production required the skill
of an expert maker of generators and motors. This generator demonstrates and con¯rms that the
Oersted °ux actually does move with the electron drift velocity of the current giving rise to it.
This discovery is a basic and fundamental contribution to electromagnetism. It also shows how this
motion may possibly serve to explain the origin of gravitation from atoms of matter. The design
of the generator itself will aid in seeing this possibility.
Momentarily, consider yourself in the place of a Maxwell demon, one who can see, from without,
the planetary electrons of an atom orbiting about the nucleus. On the average, we may assume
that there are as many going in one direction as in the opposite direction, in an approximate orbital
plane. If these charges carry their Oersted magnetic °uxes with them, in the space surrounding an
atom of matter, these moving °uxes will project an induced motional electric ¯eld, radially directed
toward the nucleus.
The design of the motional electric ¯eld generator was such as to imitate in an elementary way
the planetary electrons in an atom. The device involves no mechanically moving parts. It is wholly
electrical.
The generator consists of 4020 insulated parallel linear conductors, *J*11, formvar insulated cop-
per wire, nine inches in length, all connected in series and packed orderly side-by-side and tightly
sealed together with epoxy into the shape of a solid, right circular cylinder. The series connections
were accomplished by turning the wired through 180 degree angles without breaking the insulation.
The two terminals connected to this composite of linear conductors are brought together at the
axis of the cylinder and connected to a shielded and grounded two-wire cable. When energized by

a direct current, 2010 conductors are at any instant carrying current and magnetic °ux vertically
downward, and the same number of conductors are doing the same thing vertically upward. This

composite cylinder is thus non-inductive with no measurable magnetic °ux surrounding it. The
principle of super-position of ¯elds shows that each of the two sets of linear conductors contributes
a motional electric ¯eld directed radially inward toward the axis of the cylinder. The superim-
posed magnetic °ux from these two sets of conductors consists of horizontal circular °ux loops,
half directed clockwise and the other half counter-clockwise, half moving upward and half moving
downward. Thus, we have a unique condition in the space surrounding the cylinder: the resultant
magnetic °ux, due to superposition of ¯elds, is zero; and the resultant motional electric ¯eld in-
tensity is $\sim E = \sim B_1 £ \sim V_1 + (i \sim B_1 £ i \sim V_2) = 2 \sim B_1 £ \sim V_1$, or double the intensity attributable to one
set of conductors alone, where $\sim B_1$ is the magnetic °ux intensity due to 2010 linear conductors and
$\sim V_1$, the electron drift velocity in, say, the positive upward direction. Although the magnetic °ux
energy in this device is reduced to zero, the electromagnetic induction giving rise to what we term
the motional electric ¯eld has by no means been cancelled nor reduced.
The motional electric ¯eld is projected into the space surrounding our generator when the
DC current therein is 30*amperes*, equivalent to that which would be associated with the un-
cancelled magnetic °ux around a single conductor carrying a current of over 120*;* 000*amperes*
(4020 £ 30 = 120*;* 600*ampereturns*).

Experimental Measurements

The motional electric ¯eld intensity is studied an measured by the use of a highly insulated, stain-
less steel cylindrical capacitor, placed around the generator, the inner cylinder of which is grounded
and the outer cylinder is connected to the input head of a Keithley 640 Vibrating Capacitor Elec-
trometer. A diagram of the circuitry employed in operating our generator is shown in Figure 1.
The generator with its cylindrical capacitor about it is placed within a large grounded stainless
steel cabinet. The vibrating capacitor electrometer head is also placed in the cabinet, close to
the cylindrical capacitor, and connections are made to each plate. All connecting wires between
the electrometer head and the galvanometer are electrostatically protected by grounded shielding.
The electrometer galvanometer is outside the cabinet and has a grounding terminal for the whole
electrometer system. The vibrating capacitor in the electrometer is energized by a small storage

battery built into the electrometer galvanometer case. The inner capacitor cylinder, made of $\frac{1}{8}$"
stainless steel, is insulated from the generator conductors by epoxy, and forms a partial housing.
The epoxy covering the two ends of the generator is covered with a heavy coat of sprayed silver and
this, with the inner capacitor cylinder, forms a completely grounded electrostatic shield around it.
The motional electric ¯eld, caused by the up and down movement of the slowly moving (virtual)
magnetic °ux loops, induces an emf in the surrounding space and in the wire connected to the
electrometer head and its ground connection. The capacitor plates are thus charged, the potential
di®erence of which is registered by the electrometer galvanometer.
The potential di®erence is obtained by integrating the line integral of the electric ¯eld intensity
$\sim E$
between the capacitor plates. It is given in mks units by:

Figure 1: Diagram of Circuitry employed for generating & measuring the motional electric ¯eld.
$$P.D. = \int_{r_1}^{r_2} \sim E \, dr = \int_{r_1}^{r_2} \sim B \pounds \sim V \, dr = \int_{r_1}^{r_2} \frac{\mu_0 nIV}{2\pi r} \, dr \quad (1)$$
where $B = \frac{\mu_0 nI}{2\pi r}$ $webers/meter^2$ and r_1 and r_2 are the distances respectively from the axis of the generator to the outer surface of the inner capacitor plate, and the inner surface of the outside capacitor plate.
Thus, we have a typical example of how we can obtain the drift velocity $\sim V$, when $r_1 = 0.1 meter$, $r_2 = 0.1035 meter$, $\mu_0 = 4\pi \pounds 10^{-7}$; $n = 4020$; $I = 10 amps$; $P.D. = 5 \pounds 10^{-6} volts$. Integrating (1), we have:
$$P.D. = \frac{\mu_0 nIV}{2\pi} \int_{r_1}^{r_2} \frac{dr}{r} = \frac{\mu_0 nIV}{2\pi}$$

$(ln(r_2)\ i\ ln(r_1))$ (2)
Solving for the drift velocity $\sim V$
, we have:
$V =$
$2¼P{:}D{:}$
$^{1}{}_{0}nI$
$(ln(r_2)\ i\ ln(r_1))meter$
sec
(3)
$V = 1{:}78\ £\ 10_{i2}\ meters$
sec
$= 1{:}78cm$
sec
The classical derivation of the electron drift velocity is given by $\sim V$
$= {}_{\sim j}$
${}_{n}e$ where $\sim j$ is the current
density ($j =$ 10
$0{:}04172$
amp
cm_2), and n is the number of conduction electrons per cubic centimeter, and e
is the charge on the electron ($1{:}6021£10_{i19}coul{:}$). Using Avogadro's number, $N =$
$6{:}02252£10_{23}$
for calculating, $n = {}_{dN}$
M, where d is the density, $9{:}96\ {}_{gm}$
cm_3, and M is the atomic weight, $63{:}546\ {}_{gm}$
$mole$,
for copper, we have:
4
$V =$
$239{:}69$
$8{:}96\ £\ 10_{22}\ ¢\ 1{:}6021\ £\ 10_{i19} = 1{:}762\ £\ 10_{i2}\ cm$
sec
A decrease of 100-fold in n, as indicated by Fermi-Dirac statistics would bring the experimental
value of the same order of magnitude as the theoretical.
Measurements of electrometer potential di®erences $P{:}D{:}$ versus direct current values I, when
taken quickly so as to prevent appreciable change in the temperature of the generator, due to elec-
trical heat loss, yields a most interesting curve. Typical of most of the curves is the one shown
in Figure 2. The magnitude of the motional electric ¯eld intensity will be seen to be directly pro-
portional to the virtual value of the °ux $\sim B$
involved, and hence to the current. The value of the
electron drift velocity will also be directly proportional to the current. Thus the potential di®erence
measured versus current values yield a parabola.
Figure 2: Capacitor Potential Di®erences measured as a function of DC current to the generator.
It is interesting to note that when alternating current values were plotted against electrome-
ter de°ections that a straight line was obtained instead of a parabola. This is illustrated in Figure 3.
Figure 3: Capacitor potential di®erences measured as a function of AC current to the generator.

New Research Instrumentation

When improved and perfected, this motional electric ¯eld generator, together with a capacitor and an electrometer, appear to o®er unique instrumentation for directly measuring the electron drift velocity in metals. Experimental values obtained with our generator are in good agreement with accepted values. Making measurements at various temperatures will a®ord a method of directly determining the quantity *n*, the number of free conduction electrons available per unit volume, thus a®ording an experimental check on the Fermi-Dirac statistics method for obtaining this quantity.

Crucial Experimental Evidence

It was, of course, necessary to run down every conceivable possible source of error. The question has been raised as to whether or not the potential di®erence electrometer measurements that we have observed as a function of input current to our device might arise from the thermoelectric e®ects instead of from the assumed $\sim B \pounds \sim V$ ¯eld. It is true that at 30*amperes* input, approximately 3300*watts* of electrical power is being poured into our device, and it heats up at this rate, percepti- bly to the hand, in a time interval of four to ¯ve minutes. It has been suggested that the juncture between the copper wire and the inner cylinder of the capacitor might be raised in temperature more rapidly than the juncture on the outer cylinder and thus give rise to an observed emf. To examine such a possibility, we have made a series of measurements requiring only a few seconds for each reading. Starting with a 30*ampere* input, we have gone down to 25, and then to 20, 15 and 10, then back up the scale in 5*ampere* steps to 30 and again back down to 10*amperes*. The observed values of potential di®erence at each value of current were substantially identical. It does not seem reasonable to think that the innermost juncture could jump up and down in temperature values in a matter of seconds, permitting the electrometer galvanometer needle to return to its zero position immediately after each input value of current. When the device really warms up, each of the observed potential di®erences becomes enhanced and the plotted curves retain a nearly parabolic shape. We have, therefore, ruled out thermoelectric e®ects as giving rise to our observed measurements.

It has been suggested that possible non-cancelled magnetic fringing from the linear conductors acting on the innermost stainless steel cylinder might change the Fermi level of the metal and alter

the contact di®erences of potential between the inner and outer cylinders of the capacitor. To
eliminate this as a possible cause, a much larger diameter cylindrical capacitor was placed around
the original one. The two plates of the ¯rst capacitor were grounded and measurements were made
from the outermost capacitor alone.
The possibility that stray magnetic °ux from the composite linear conductors, linking with the
electrometer circuit, might give rise to the observed measurements was considered. A sensitive
gaussmeter probe was employed to test for the existence of such °ux. The maximum value found
for such °ux was of the order of half a gauss, found in one spot. To dispel all doubt, however, as
to stray magnetic °ux, a fairly large circuit, consisting of ¯ve wires was formed so that one side
of the circuit came in radially from a distance of one foot to the central equatorial surface of the
device, where it was held by tape and brought along parallel to the axis for several feet. This circuit
loop was connected to a very sensitive microvoltmeter which was observed while various values of
6
input current up to 30*amperes* was sent into the linear conductors. No indication of an induced
emf could be observed.
It is evident that the charging of the capacitor plates might possibly be due to charges carried
by the current in the two wires leading onto the generator. If these wires are each at di®erent
potential di®erences with regard to the round, they carry an electric charge into the interior of the
conducting housing enclosure of the generator and thus cause a charge of similar amount to appear
on the outside of it and to produce a potential di®erence between the capacitor plates. This was
experimentally con¯rmed by the inventor. When the generator housing was this raised to a positive
potential di®erence with respect to ground, the electrometer de°ections were to the right of center.
When the housing was raised to a negative potential with respect to the ground, the electrometer
de°ections were to the left of center. These tests were made in two ways: (1) with no current °owing
to the generator and (2) with current °owing, but one lead wire at a higher, or lower, potential
with respect to ground than the other. Thus, it became evident that the two wires leading to the
generator, with the grounded shielding, can be prevented from carrying a charge into the interior of
the generator of the two wires are each constantly maintained at exactly the same value of potential
di®erence above and below ground potential. A special power supply was built to provide this re-

quirement. The voltage of each wire entering the generator was tested for various values of current
and the potential di®erences were found to be accurately identical, above and below ground. Now,
the de°ections of the electrometer for various values of current were always to the right of center,
indicating a electric ¯eld directed toward the generator was charging the plates. This ¯eld could
not have come from a charge on the grounded generator housing with no net charge entering the
generator, since such a possibility was carefully eliminated. Thus, the electric ¯eld must be due
to the predicted $\sim B \pounds \sim V$ ¯eld. It is always directed toward the generator. This is a distinguishing
characteristic of the $\sim B \pounds \sim V$ when it is due to the movement of electrons. If the current were due to
the movement of positrons or protons, then the $\sim B \pounds \sim V$ ¯eld produced would be directed away from
these currents instead of towards them! Alternating current thus produces electrometer de°ections
to the right of zero center the same as direct current, and this can be explained only in terms of the
$\sim B \pounds \sim V$. Had the electrometer de°ections been due to electrostatic charging, the electrometer needle
would have remained under the alternating impulses, 60 times each second, when AC current was
used.

The argument has been advanced that the movement of the magnetic ¯eld with the free as well
as the orbital electrons in a piece of metal would result in a considerably inwardly directed motional
electric ¯eld in the space all around this metal piece, contrary to experience. Our reply to this argu-
ment is that the motional electric ¯eld, thus undoubtedly built up in the space around the metal, is
in fact the weak gravitational ¯eld emanating from it. True, it has never been detected as an elec-
tric ¯eld, and we claim that this probably is due to its very high composite frequency nature. We
know from gravitational experiments that there exists just such an inwardly directed force around
the metal. We know that it cannot be electrostatic nor magnetic. Yet, it does emanate from an
aggregate of electromagnetic sources. We have good reason to believe that in view of the immunity
of the motional electric ¯eld to shielding that this ¯eld could provide the ¯eld agency for
gravitation.

7

Electromagnetic Induction With Zero *B* Is Not New

Our generator somewhat resembles a properly wound toroidal coil in that, in the same space outside
such a coil, carrying current, we know that $\sim B$
is zero due to the principle of superposition of ¯elds.
We know that when alternating current is surging back and forth in its coils that a non-electrostatic,
electromagnetically induced electric ¯eld is present continuously in this space around it, where the
magnetic ¯eld intensity is continuously zero. The resultant magnetic °ux energy in our generator
is reduced to zero while the electromagnetic induction due to the movement of virtual Oersted °ux,
in each of the two vertical directions, gives rise to what we call the motional electric ¯eld in the
space surrounding the generator.
A simple experiment can be performed to convince one that electromagnetic induction takes place in a space where the resultant magnetic intensity has been reduced to zero by superposition
of ¯elds. With soft iron sheet, form a cylindrical magnetic shield about a meter in length and a few
centimeters in diameter. A sti® wire should be held centrally within the cylindrical tube, and both
tube and wire moved horizontally in a North and South direction across the vertical component
of the earth's magnetic ¯eld, while the two ends of the sti® wire are connected to a sensitive gal-
vanometer. A de°ection of the galvanometer needle will readily measure the induced emf produced
within the shielded wire, where the magnetic ¯eld intensity has been reduced to zero. The wire was
not in motion with respect to the shielding magnetic °ux induced in the shield, but it was in mo-
tion across the earth's vertical magnetic component. Now, hold the sti® horizontal wire stationary
and move the cylindrical shielding horizontally at right angles to its length a permissible distance,
approximately that of its inside diameter. Again a de°ection of the galvanometer will measure the
induced emf within the sti® wire which was stationary with respect to the earth's ¯eld, but was cut
by the magnetic ¯eld within the shield, which reduced the resultant ¯eld therein to zero. If accu-
rately measured, the emf induced in the shielded wire will be found identical for the same movement
when no shield at all is employed. In one case, $\sim B$
$= 0$; in the other case, it is a real measurable value.

Mechanical Generation & Con¯rmation

The special distribution of motional electric ¯eld directed radially about the equatorial region of the
generator was explored by means of a squirrel cage-like rotor, made up of parallel electromagnets all
similarly directed so that, in some respects, it simulated the rotation of a unipolar magnet about its
magnetic axis of symmetry. This apparatus is by no means such a magnet because its design is such

to preclude a symmetrically uniform distribution of magnetic °ux about its rotational axis. The
rotation of this system of electromagnets a®ords an interesting experiment because here we have
loops of magnetic °ux of constant intensity completely ¯lling the space about the rotor, all similarly
directed from one end of the system to the other, and all in rotation about the same axis with the
same angular velocity, and having a de¯nite and constant °ux pattern in space, not symmetrical
nor uniform in the sense of a unipolar magnet though in a sense simulating one. That this magnetic
¯eld system rotates was readily demonstrated by means of a rectangular pickup coil placed close
to the rotor and parallel to the array of electromagnets. When rotating at a speed of 10*;* 000*rpm*
an AC voltage of 15*volts* was obtained due to the humps of similarly directed magnetic °ux which
entered and left the coil. With a very sensitive zero-centered voltmeter, one could rotate the rotor
by hand and demonstrate the rotation of the °ux very visibly. A semi-cylindrical capacitor was

next placed over the top of the rotor, with two wires centrally and radially directed (from the rotor
axis) to an electrometer. In this experiment, the wires from the capacitor plates to the electrom-
eter are cut by the unidirectionlly rotating magnetic °ux which induces the motionally induced
emf in this space, and is detected and measured by the DC voltage to which the capacitor plates
are raised. With this apparatus one can demonstrate that rotation of the rotor in one direction
yields a radial inwardly directed motional electric ¯eld, while rotation of the rotor in the opposite
direction reverses the direction of the motional electric ¯eld, thus demonstrating the vector nature
of the ¯eld by changing the sign of $\sim V$
in the vector product $\sim E$
$= \sim B$
$£ \sim V$
, and $i \sim E$
$= \sim B$
$£ (i \sim V$
).
By keeping a constant rotation and reversing the direction of the current to the electromagnets,
the direction of $\sim B$
can be changed while $\sim V$
is held constant. In this manner the direction of the
motionally induced electric ¯eld can also be reversed in the surrounding space and can be made
either radially inward or radially outward as evidenced by the zero-centered galvanometer needle of

the Keithley 640 vibrating capacitor electrometer which was used to make the DC voltage measure-
ments. The demonstration that a spacially distributed motional electric ¯eld exists around either
our mechanical or our all-electric generator appears to us to be amply demonstrated. To be more
certain, however, we obtained the services of a disinterested expert in electronics measurements to
come in and check our work with a sensitive Tectronic electron oscillograph, which con¯rmed our
observations with the Keithley Electrometer.

Relation To Relativity

The question arises as to how this new ¯eld ¯ts into the Relativity theories? It de¯nitely provides an
interesting clari¯cation of a hitherto speculative deduction which many relativitists have ventured
to make with respect to the $\sim V \pounds \sim B$ motional electric term which enters into the transformation equa-
tions of the Special Theory as applied to electrodynamics. It has been claimed that this $\sim V \pounds \sim B$ term
is electrostatic in its fundamental nature. This conclusion is now de¯nitely shown to be incorrect by
the advent of the new motional electric ¯eld generator, the ¯eld of which emanates from a grounded
conducting metallic container and passes readily through any shield. The non-electrostatic nature
of the $\sim V \pounds \sim B$ has also been pointed out by Winch: "Notice that the $\sim E$ of ($\sim E = \sim V \pounds \sim B$) is not an
electrostatic ¯eld intensity for it is not due to a distribution of charges" (6). Nature has de¯nitely
not limited us to one type of electric ¯eld. The motional electric ¯eld is di®erent in origin and
fundamental properties from the electrostatic ¯eld arising from charges.

The writer embraces the position taken by Sir James H. Jeans in his explanation of the Special Theory of Relativity and its bearing upon the two electric ¯elds in the transformation equations. He points out that there is nothing in the postulates of the Special Theory that requires a physical interpretation of the two electric ¯eld terms $\sim E$ and $_{c}{}^{\sim V \pounds \sim B}$ in the transformation equation

$$\sim E_0 = h \sim E i_{I_c}{}^{\sim V \pounds \sim B}$$

i
. He states: "The equations may be taken merely as expressing relations between quantities as measured by the observer S and another S_0 moving with a velocity $\sim V$ relative to S" (7). Thus we see that there is no con°ict with the Special Theory of Relativity. The philosophy of the Nobelist, P. W. Bridgman, whose "Operational Viewpoint" as set forth in his text, The Logic of Modern Physics (8), has guided the inventor in his work on this project. As Bridgman predicted, it has led to new and fundamentally basic knowledge.

9

That the gravitational ¯eld may possibly be identi¯ed as a motional electric ¯eld is at least very strongly suggested by the experimental work described herein. The claim of the General Theory of Relativity that the Gravitational ¯eld is equivalent to that of centrifugal force would appear to be a concept far removed form that of presenting it as a motional electric ¯eld. The experimental fact remains, however, that a pure motional electric ¯eld projected into space does simulate, in some respects, the gravitational ¯eld.

When the current °owing into this generator is constant, the motional electric ¯eld surrounding it is also constant and static, but not electrostatic, because it does not originate or terminate on charges. It readily passes through two $\frac{1}{8}$" thick sheets, or $\frac{1}{4}$" of stainless steel, constituting the cylindrical capacitor plates. The exciting thing about this generator is that it throws this $\sim B £ \sim V$ electric ¯eld out into the space around it. It is not electrostatic, not magnetic, and is immune to shielding. These properties make it a unique force in nature with possibly great utility to mankind.

Polarization & Absorption

Objects placed in this ¯eld are electrically polarized, and in making measurements of its intensity, the electrostatic ¯elds arising from such polarization have to be reckoned with. From a well-known general theorem (9) we know that an intense convergent motional electric ¯eld would be attractive on any material object placed within it, due to this internal polarization. The recent experimental work of L. Brauner on the electric polarization due to gravity, is most interesting, as reported in the January 1969 issue of *Endeavor* magazine (10). His experiments convincingly show that the shoots and roots of plants when lying in a horizontal plane become electrically polarized. When turned into a vertical plane, this polarization soon disappears. Brauner presents excellent evidence in support of the conclusion that this phenomenon is due to the electrical nature of the earth's gravitational ¯eld.

This indicates in a limited way direct absorption of gravitational ¯eld energy. Of course, our hydro-electric plants are utilizing this energy in large quantities where advantageous sites for such
plants can be found. The greatest potential inherent in the research described herein, the writer
believes, will ultimately be in the direct absorption and conversion into useful electric power the
vast reservoir of gravitational ¯eld energy which as yet has hardly been tapped. The insight into
what we believe to be the mechanism within atoms which gives rise to the phenomenon of gravity,
encourages us in the conviction that we can directly absorb and convert it to the service of mankind.
Our research in this direction has commenced and is very encouraging.
Spacewise, this project has some speculative possibility, if and when this generated ¯eld can be made su±ciently intense. We have very considerable reason to believe that by the use of su-
perconducting wire and liquid helium temperatures, this can be accomplished. To what extent is
speculation at present, but theory would indicate that if intense ¯elds are ever possible of genera-
tion, then the phenomenon of changing the weight of objects, and of even producing weightlessness
and anti-gravity (that is, lift instead of downward pull on objects) would be possible.
Domestic and foreign patent applications covering the various generators and devies employed
in our work have been ¯eld and some have been granted.
10

References

[1] Albert Einstein: *Essays in Science*, p. 10, Philosophical Library, NY,1934.
[2] W. J. Hooper: "*Equivalence of the Gravitational Field and a Motional Electric Field*"; Proceedings of the Boulder Conference on High Energy Physics, Division of the American Physical
Soc., Aug. 18-22, 1969, p. 483; "The Motional Electric Field Generator"; Bull. of the American Physical Soc., February 1970, p. 207.
[3] Clerk Maxwell, *Electricity & Magnetism*, p. 181, vol. II.
[4] W. J. Hooper: *New Horizons in Electric, Magnetic & Gravitational Field Theory*, Principia College Library, Elsah, IL.
[5] E. G. Cullwick: *Electromagnetism & Relativity*, p. 245; Longsman, Green & Co., 1957.
[6] Ralph P. Winch: *Electricity & Magnetism*, 2nd Edition, p. 399, Prentice Hall, Inc., 1963.
[7] J. H. Evans: *Mathematical Theory of Electricity & Magnetism*, p. 606; Cambridge Univ. press,
4th Edition, 1923.
[8] P.W. Bridgman: *The Logic of Modern Physics*; Macmillan Co., 1928.
[9] Jeans, *op. cit.*, p. 125; illustrated by a block of dielectric material being sucked in between two
charged capacitor plates.
[10] L. Brauner: "*The E®ect of Gravity on the Development of Electric Potential in Plant Tisues*";
Endeavor, Jan. 1969.

by
Frances W. Gibson

This is the written version of a talk given at the Second International Symposium on Non-Conventional Energy Technology in Atlanta, GA (February 10, 1983). It is based entirely on the theory and experimental work of Dr. William J. Hooper, BA, MA, PhD in Physics from the University of California, Berkeley, and formerly Professor Emeritus at Principia College, Elsah, IL.

Copyright 1983, Electrodynamic Gravity, Inc., 34 W. Tallmadge Ave, Akron, OH 44310

Preface ~

From 1968 to 1971, my husband, Warren W. Gibson, financed the research of Dr. William J. Hooper. I worked with Dr. Hooper as secretary and laboratory assistant. He explained his theory and the intent of each experiment to me as the work progressed. I was personally present when every experiment was performed during this time.

After Dr. Hooper passed on in 1971, I tried to perform an experiment with a vacuum tube generator which he had designed. On my first attempt I burned out the tube, and with that I lost confidence in my ability to do the research on my own.

I satisfied my desire to continue the work with the publication and sale of his manuscript, and with the hope that it would spark an interest in someone who would want to carry on the research. There has been much interest expressed in his theory and research, but to my knowledge there is no one presently continuing the work.

Many people who have read Dr. Hooper's manuscript have asked for more experimental data. This paper includes that information.

Frances G. Gibson

The All-Electric Motional Field Generator & Its Potential

The history of scientific progress shows that new discoveries often are not made until some old assumptions are challenged and found to be wrong. Dr. William J. Hooper challenged the assumption of electromagnetic theory that there was only one electric field in nature, the electrostatic, and that led to more challenges of current theory.

In his manuscript, *New Horizons in Electric, Magnetic, and Gravitational Field Theory*, Dr. Hooper defines three electric field with distinct characteristics: the electrostatic, which is very familiar, the transformer electric field, which is produced by a changing magnetic field intensity; and the motionally induced electric field, which is the product of relative motion between a conductor and a magnetic field. A table on page 15 of his book shows the major differences in the properties of these fields.

When all his experiments indicated that the motionally induced electric field was incapable of being shielded by ordinary electrostatic or magnetic shielding materials, he pondered the possibility that this field was akin to gravity, which has characteristics similar to an electric field except for its inability to be shielded. This paper will not deal with his extensive shielding experiments which are thoroughly described in his manuscript and were done before my time.

Let us review again the nature of this motionally induced electric field. When magnetic flux is moved perpendicularly across a conductor, we say that an emf is electromagnetically induced

within the conductor. This phenomenon has been little thought of as involving the production of a spacially distributed electric field. It arises from the operation called flux-cutting, wherein the electric field is motionally induced within the space occupied by themoving magnetic flux, and is present therein, whether a conductor is present in this space or not.

Correctly defined, we can say that when magnetic flux of vector intensity $\underline{B}$ is moved across a region of space with vector velocity $\underline{V}$, an electromagnetically induced electric field of vector intensity $\underline{B} \times \underline{V}$ makes its appearance in this space at right angles to both B and V. Therefore,

(Eq. 1) $\underline{E} = \underline{B} \times \underline{V}$

It is this field that Dr. Hooper felt might be related to gravity. I will hereafter refer to this field as the motional E field.

After contemplating the structure of the atom, Dr. Hooper concluded that if the charged particles in the atom, especially the electrons and protons, acted like miniature magnets, their motion would create in the space surrounding the atom this motional E field. The field created by the motion of both the positive and negative charges would cancel to some degree, but because the velocity of the negative electron in orbit is greater than the velocity of the positive proton in the nucleus, the induced field of the electron would dominate. He determined that the field due to the orbital motion of these charges would vary inversely as the square of the distance, the same as gravity. He also determined that the field produced by the translational motion of these charges would vary inversely as the cube of the distance. These observations may totally unite electromagnetic and gravitational field theory and account for the strong and weak forces in the atom.

If his theory is correct, Dr. Hooper envisioned the ability to tap the gravitational field of any planetary body for electrical energy, free from pollutants, with a properly designed ultra-high frequency receiving circuit, incorporating an antenna, a transistor valve, and oscillating tank circuits. When he learned of the work of Thomas Henry moray, he was convinced that Moray had tapped the earth's gravitational field, and he expected Moray to complete this work for mankind, so he decided to concentrate his research on proving his theory.

When he passed on in 1971, Dr. Hooper was sure he had done this, as he had been issued patents on two generators, a mechanical one, Patent # 3,656,013, and an all-electric one, Patent # 3,610,971. Dr. Hooper spent many years building devices to rotate magnets at high speeds, but always found that the magnetic field of the magnets, and the vibration and noise of the motors interfered with his attempts to measure the field with either a capacitor connected to an electrometer or a gravity meter.

In 1968, soon after I began working with Dr. Hooper, he conceived and built a device which would eliminate all previous problems because there would be no measurable magnetic flux and no motors. He called it the All-Electric Motional Electric Field Generator. Its design was based completely on his theory of gravity, and how he believed gravity was produced in the atoms of matter. If his theory was correct, he expected his device to produce a motional E field outside the generator by the movement of the magnetic field associated with the conduction electrons making up the current flowing in the copper wire of the generator.

Figure 1 shows the design of the generator. It consists of one length of #11 formvar insulated copper wire, 924 meters long, bent 180 degrees at nine-inch intervals and packed side -by-side with the two ends emerging together from the top. These nine-inch linear conductors, 4020 in all, were then sealed together with epoxy in the shape of a right circular cylinder. When energized by direct current, half of the conductors, 2010, would be carrying current and magnetic flux

vertically downward, and the same number would be carrying them vertically upward. Thus, the generator is non-inductive, having no measurable magnetic field around it. But Dr. Hooper hoped to find something else around it, the motional E field, similar to gravity in that it could not be shielded.

Figure 1 [Not shown]

Electromagnetic induction with no measurable field is not new. It is well known that in the space outside a properly wound toroidal coil, there is no magnetic field due to the superposition of fields, and yet, when alternating current is surging back and forth in it, a transformer electric field is present in the space surrounding it.

Let's see what happens when we apply the principle of superposition of fields to this device. This principle says that in order to find the resultant intensity of superimposed fields, each field should be treated as though the other were absent; the resultant is obtained by the vector addition of each field considered singly. When the current in half the wires in this generator is moving up, both the current and the magnetic field follow the right hand rule, and the motional E field would be vertical to both and inwardly directed. At the same time, the current in the other half of the wires is moving down, and both the current and the magnetic field follow the right hand rule and the motional E field is again vertical to both and inwardly directed. Therefore, the resultant field intensity is double the intensity attributable to one set of conductors.

Here is how it is expressed mathematically:

(Eq. 2) $E = (\underline{B} \times \underline{V}) + (-\underline{B} \times -\underline{V}) = 2(\underline{B} \times \underline{V})$

where E is the electric field intensity, $\underline{B}$ is the magnetic field that is moving with the electron drift velocity, $\underline{V}$. The first $\underline{B} \times \underline{V}$ in the equation represents the flow of the magnetic field when the electrons are moving in one direction in the wire, and the second term $(-\underline{B} \times -\underline{V})$ represents the flow of the magnetic field when the electrons are moving in the other direction. E is the sum of both $\underline{B} \times \underline{V}$'s.

Figure 2 [Not shown]

Figure 2 pictures how we measured the presence of this motional E field. A highly insulated, stainless steel capacitor was placed around the center of the generator. The inner capacitor plate was connected to the heavy coat of conductive silver, shielding the rest of the generator and then grounded. The outer capacitor plate was connected to the input head of a Keithley 640 Vibrating Capacitor Electrometer. This particular electrometer with its high input resistances and its vibrating capacitor seemed ideal for this purpose. The generator with its capacitor and the head of the electrometer were then placed inside a stainless steel cabinet. All the connecting wires between the electrometer head inside the box and the galvanometer outside the box were electrostatically shielded, as well as the leads to the generator from the power supply. Everything was grounded through a terminal on the electrometer. Now, we were ready to energize the generator with up to 30 amps of current from our power supply and measure the motional E field on the outside.

The predicted value of the measurement was in the low microvolt region. Dr. Hooper, through working in college physics laboratories for over 40 years, was well aware of the many problems associated with taking measurements in the microvolt region, and we had to test for and guard against them all. Our greatest problems came because we were unaware of the tendency for an electrostatic field to be generated equally and oppositely to this motional E field, and how frequently this phenomenon occurs. One time when we used one thick capacitor plate and one thin one, we discovered that the motional E field set up an electrostatic distribution within the

thick capacitor plate, and reversed the charge on the outer plate. When capacitor plates of equal thickness were used the motional E field measurement was always positive.

Another problem we had involved the unbalance of our power supplies. We used two power source: our own specially built one, designed to rectify 220 AC voltage to low ripple DC voltage, providing a maximum of 275 DC volts and 30 amps, and occasionally, 12 volt car batteries connected in series to compare results. At one point we discovered that when the current from the power source entered from one direction, the measurement of the motional E field was less than when it entered from the other direction. Here, in Dr. Hooper's own words, is how he accounted for this problem: "The question arises as to why there would be a difference in readings because of an unbalance in the power source, as the inner capacitor plate is grounded, and the law is that there would be no electrostatic charge on the outside of a grounded enclosure. The interesting thing is that the only answer seems to lie in the fact that there is a motional E field present. If there is an unbalance on the inside of the container due to an unbalance in input voltage, the normal thing would be for charge to flow through the ground wire to balance the charge in the inside of the capacitor. However, if the motional E field was acting in the ground wire one way, it would oppose the flow of electrons toward the shield and, therefore, would allow an electrostatic charge to remain on the inner capacitor plate and affect the readings." We had to realize the significance of the fact that this field permeates everything.

Dr. Hooper's explanation seemed to be confirmed by close observation of the needle on the electrometer in an experiment done immediately following this discovery. In that experiment, 100 V was applied to the generator; 26 amps was the resulting current. When the direction of the current was one way, it was recorded that the electrometer needle first went negative to 11 microvolts, and then positive to 17 microvolts. When the current was reversed, the electrometer needle only went positive to 28 microvolts. The difference between the two final readings was 11 microvolts, the same as the negative deflection. When the input voltage was balanced between positive and ground and between negative and ground, the measurements of the motional E field were the same when the current was flowing in either direction.

The above figures are not comparable to the measurements that will be referred to later because different size capacitor plates were on the generator. The measurements I will be using were taken before this discovery, but we did not redo them because we saw that the unbalance was always a negative factor, causing our readings to be less, never more. Dr. Hooper did not feel that it changed the conclusions reached, even though the exactness of the measurements might be questioned.

Between February 4 and July 19, 1969, when the generator was in the condition shown in Figure 2, we varied temperature, resistance, types of current, and types of power supplies. Measurements were taken by hand at 5 amp intervals, up to 30 amps. We did not have the sophisticated equipment that is available in many laboratories today. Voltage often was not taken because it was felt that if we took our measurements only when the generator was cool, the voltage would remain the same, and we wanted to move up the scale quickly before the generator could heat up. Also, Dr. Hooper felt that the amperage was the most important factor because theory predicted that the field intensity would be directly proportional to the square of the amperage, because it is proportional to the virtual value of the magnetic field, which is proportional to the current, and to the electron drift velocity, which theory says is proportional to the current.

The following table provides some typical measurements of the potential difference measured across the capacitor plates by the electrometer at room temperature. The PD reading in the third

column will be the significant figure to watch from here on. This is what we considered to be the measurement of the intensity of the motional E field produced by this generator. This measurement was never just a swing of the electrometer needle and then back. These measurements were steady on the electrometer as long as the amperage reading was held the same, showing that the field was being produced continuously. Now, I don't mean to say that on such a sensitive electrometer the needle was completely stable, but when the amperage was turned up the needle went up also and the instability was always in the area of the measurement; when we turned the amperage up more, the needle continued up the scale. If we had jerks of the needle in one direction or the other, we knew we had something spurious affecting our readings, and we worked until we found out what it was, or until it was no longer there.

The PD readings on the electrometer were always very close to a parabola, as Dr. Hooper predicted. However, the magnitude varied from day to day. We determined that there were at least two possible causes of this. One, there was some evidence that 8 to 10 degrees variation in room temperature caused variations in the readings: the higher the temperature, the higher the readings. The reason for this may become clearer later. Two, the unbalance of the power supply, already discussed. You will note that the fourth column of figures on this chart shows what the predicted values of PD would be for the other amperages, based on the experimental figure at 30 amps. The predicted parabola was always close to the actual readings.

On July 19, we went up and down the scale several times because it had been suggested that our readings might be due to thermoelectric effects between the two capacitor plates. This proved they were not. If our readings had been due to heat, they would not go up and down the scale with the current. These readings also show that the reading were not due to an emf induced by changing flux. You will note, however, that after a few times up and down the scale, the generator did not begin to warm up, and the readings on the electrometer began to increase. We had noted this many times and had assumed that it was due to thermoelectric effects, and immediately stopped experimenting until the generator cooled down. However, on June 4, we decided to see just what the effect of heating was on the measurements.

Figure 3: Measurements taken when the generator was at room temperature ~

Voltage	Amperage	PD microV	Parabola at 30 amps
February 4			
35	10	7	6.7
52	15	15	15
73	20	25	26.7
91	25	40	41.7
110	30	60	60.0
February 11			
--	10	10	10.0
--	15	25	10.0
--	20	41	40.0
--	25	60	62.5
--	30	90	90.0
July 19			

--	10	15	13.9
--	15	30	31.2
--	20	55	55.6
--	25	85	86.6
--	30	125	125.0
--	25	85	--
--	20	50	--
--	15	27	--
--	10	10	--
--	15	26	--
--	20	50	--
--	15	27	--
--	10	10	--
--	15	26	--
--	20	55	--
--	25	87	--
--	30	140	--
--	25	90	--

For comparison purposes, the first set of measurements in Figure 4 were taken when the generator was at room temperature. The second measurements were taken the same day when the generator was hot to the touch. When the generator was hot, the PD at all levels increased, and you will see the curve was no longer a parabola. However, the difference was not totally due to thermoelectric effects, because there was a substantial jump back at 25 amps. Several measurements were taken with the hot generator that day with almost identical results. We were sorry that the voltage measurements were not taken because they could have given us an idea of how hot the generator was.

Figure 4: Measurements with Hot & Cold Generator ~

Amps	PD microV	Parabola at 30 Amps
Cold Generator		
10	11	12.8
15	27	28.8
25	50	51.0
25	80	79.9
Hot Generator		
10	13	25.0
15	40	56.3

20	75	100.0
25	123	156.3
30	220	220.0
--	25	30

Figure 5: Measurements with added resistance ~

Voltage	Amperage	PD microV	Parabola @ 30 Amps
Rheostat (5.3 ohms)			
50	10	11	22.2
80	15	30	50.0
107	20	70	88.9
133	25	80-100	138.9
160	30	200	200.0
Rheostat (7.5 ohms)			
225	30	360	--
Photofloods (12.3 ohms)			
160	13	100	--
Rheostat (12.3 ohms)			
160	13	100	--
Nothing added (3.7 ohms)			
48	13	15	--

Because heat resistance in the generator seemed to increase the PD measurements, it was decided to try other forms of resistance in the circuit with the generator. The first set of numbers in Figure 5 was obtained when we put a carbon pile rheostat in the line. The normal resistance of our generator was 3.7 ohms. The rheostat increased the resistance in the circuit to 5.3 ohms. We discovered that these first measurements were very similar to the ones where heat was the added resistance, in Figure 4. We then increased the resistance to 7.5 ohms, and as you can see, there was another substantial increase in the PD readings at 20 amps. Then we added photoflood at 1500 watts to the circuit, increasing its resistance to 12.3 ohms. In order not to burn them up, we only put 13 amps in the line, but if you will compare that 13 amps with the 15 amps above, you will find a substantial increase. For more comparison, we then returned to the rheostat and adjusted it to 12.3 ohms and at 13 amps we got exactly the same PD reading. Then when all resistance was removed, the reading was substantially less.

These experiments showed that our PD measurements, believed to be the measurement of the motional E field, increased with the addition of resistance in the circuit, and that the form of that resistance, whether heat, carbon pile rheostat, or photofloods, didn't make any difference.

Since Dr. Hooper anticipated that the best way to intensify this field would be through the use of superconductivity, he wanted to see the effect that cooling would have on our generator. On

February 28, we packed the generator, capacitors and all, with dry ice for five hours. Then we took the first set of measurements, shown in Figure 6. Unfortunately, there is no record of voltage, which would have indicated how cold the generator had gotten. At first the results were very puzzling to us; certainly not what Dr. Hooper had expected. The curve was not at all parabolic. When you look at the PD at 30 amps, it is not much different than at room temperature.

We soon discovered, however, that the results almost exactly fit the curve having a formula of $PD = KI^4$, where K is the proportional constant and I is the current, whereas the formula for a parabola is $PD = KI^2$. Then we became excited, for it could mean that a radical change had taken place in the drift velocity of the electrons in the copper wire, somewhere between room temperature and dry ice temperatures. If this as so, it could help explain the phenomenon of superconductivity. Whether it was a gradual change or whether there was a critical temperature, we could not tell from these experiments.

Figure 6: Dry ice measurements ~

Voltage	Amperage	PD microV	Parabola @ 30 amps
Dry ice (5 hours)			
--	10	1.5	1.2
--	15	6	5.9
--	20	17	18.8
--	25	45	45.8
--	30	95	95.0
Dry ice (17 hours)			
20	10	1.5	0.5
32	15	2.5	2.3
43	20	6	7.3
55	25	14.5	17.8
68	30	37	37.0
21	10	--	0.6
33	15	2	2.8
45	20.5	6	8.9
57	25	18	21.7
70	30	45	45.0
--	11	1	1.3
--	16	5	6.0
--	20	14.5	14.7
--	25	40	36.0
--	31	85	85.0

That night we packed the generator in dry ice overnight, 17 hours. The readings that were taken the next day all fit the formula, $PD = KI^4$. Fortunately, the first two sets of readings included voltage measurements from which we determined that the resistance had dropped from 3.7 ohms to 2.3 ohms, over one-third. You will note that sometimes we missed the proper 5 amp interval; it was because we were taking the measurements rapidly before the generator could heat up. I am sure that is also why we skipped the voltage measurements on that last run, and afterwards we were sorry we had.

Have you ever tried to visualize what happens to the electrons in a wire when AC voltage is applied? We decided to try to find out. On several occasions we put AC voltage into our generator from the 220 line coming into our laboratory and through our power supply. Figure 7 is typical of the results. You will note that the PD readings were no longer a parabola, but almost a straight line, having its beginning at less than zero. The bottom figures are the result of adding resistance to the circuit with AC current. Here again, you will note that the PD increases with the addition of resistance to the circuit.

Figure 7: AC voltage in the generator at room temperature ~

Voltage	Resistance	Amperage	PD microV
--	--	10	-4.5
--	--	15	25
--	--	20	70
--	--	25	115
--	--	30	150
With added resistance			
120	4 ohms	30	200
61	4 ohms	15	55
120	18 ohms	6.7	160
275	18 ohms	15	220

At one point we began to ask ourselves if this is the measurement of the motional E field, what is happening in those wires. Fortunately, there are formulas available to give us a clue. First of all, we determined that there was no reason to believe that the intensity of the virtual magnetic field around the generator changed with temperature when the current was the same, so therefore it must be the drift velocity of the electrons that was changing.

To get a close approximation of v_d, the drift velocity of the electrons, we used the equation:

(Eq. 3) $PD = \underline{B} \times \underline{V}\text{-}l$

where PD is the measurement of the field's intensity across the capacitor plates, l is the distance between the plates, $\underline{B}$ is the virtual magnetic field density, and $\underline{V}$ is the measurement of the drift of $\underline{B}$, which is identical to the electron drift velocity, v_d. From the formula,

(Eq. 4) $I = Aenv_d$

where I is the current, A is the cross-sectional area of the wire, e is the charge on the electrons, and n is the number of conduction electrons, we see that if v_d changes, n, the number of conduction electrons, must also change, for in this particular generator A and e are constants.

Therefore, if the drift velocity changes with temperature, so must the number of conduction electrons. If one goes up, the other goes down.

Using equation 3, and using the calculus to integrate the line integral of the electric field intensity, PD, between the capacitor plates, a more exact figure for v_d can be obtained. Doing it this way, suing the PD reading at 10 amps from one of the early experiments, Dr. Hooper determined the drift velocity to be 1.78 cm/sec. Using the classical derivation of the drift velocity, with Avogadro's number, and then decreasing it by 100 as indicated by the Fermi-Dirac statistics, he arrived at almost the same figure as the experimental, 1.762 cm/sec.

These experiments show that the number of conduction electrons remains fairly constant at room temperatures and that the drift velocity increases linearly with the current. When resistance in the form of heat, carbon pile rheostat, or photo floods was added to the circuit, the number of conduction electrons decreased from that of room temperature and normal resistance while the drift velocity increased. At dry ice temperature and at low current, there were almost ten times as many conduction electrons moving, but moving very slowly, like cars on a crowded highway. As the amperage increased, the number of conduction electrons decreased rapidly, causing a greatly accelerated increase in the electron drift velocity. When AC current was put in the generator, it appeared that 3 to 4 times as many electrons were moving at low amperage as move under DC current at room temperature, but as with dry ice, when more electrons were moving, they were moving very slowly. By the time the amperage increased to 20 amps the number of electrons had decreased to almost the same number as with DC current at room temperature. From 20 to 30 amps the number of electrons remained fairly constant. The electron drift velocity increased rapidly at low amperages and continued to increase but at a decreasing rate at higher amperages.

These observations regarding electron drift velocity and number of conduction electrons would appear to be more consistent with current theory regarding gases, semiconductors, and semi-metals, than with the current theory for metals. If these findings are true, they would seem to indicate that the conductivity of a metal is related to the number of electrons in motion and their velocity, both of which change with temperature and resistance.

In his book, *Electromagnetism and Relativity*, published in 1957, E.G. Cullwick predicted, based on experimental evidence, that the magnetic field of the electron could move with the electron drift velocity. He also said, "Measurements of the normal Hall effect in metals are often assumed to confirm the conventional view that all the available conduction electrons participate continuously in a conduction current." He then shows that this need not be so.

The question is usually asked about how this motional E field fits into the relativity theories. Dr. Hooper has a section in his manuscript where he says that he feels there is no conflict with the Special Theory of Relativity, only with how it is currently being interpreted by some relativists. It does appear to conflict with the General Theory of Relativity.

In the beginning I said that Dr. Hooper began by challenging the assumption of electromagnetic theory that there is only one electric field, the electrostatic, and that this led him to make more challenges of field theory. In formulating his theory of gravity, he had to challenge the belief that the magnetic field, known to be present when an electron is in motion, does not move with the electron. However, if his theory is correct, we have a solid basis for a unified field theory, based on the motional E fields created when the charges in the atoms are in motion. When he built a generator to test his theory, the results challenged the belief in current theory that the electron drift velocity in metals does not change with temperature, an aspect of current theory which makes metals different from all other substances, gases, semiconductors, and semi-metals.

Dr. Hooper not only visualized that if his theory were correct that we could tap the gravitational field for energy, "atomic" energy in its most usable form; he also saw the possibilities, if this motional E field could be intensified enough, of gravity-free areas on earth, artificial gravity in space, space vehicles, and even off-the-road vehicles on earth. He felt that this field could be used for communication through previously impenetrable barriers, and to separate ions, such as in the desalination of water and the control of thermonuclear plasma.

Now, let's go back to Equation 1, $\underline{E} = \underline{B} \times \underline{V}$, where $\underline{E}$ represents the intensity of the field we were producing. That intensity represents the strength of the field. It must be substantially increased before the field can be made useful. The V in the equation represents the electron drift velocity in the material making up the generator. An increase in the drift velocity would increase the field's intensity. This research indicates that it can be done at both higher and lower temperatures, and with increased resistance in the circuit. Hence, it provides a direction for more research.

To begin, most would want to duplicate the experiments here outlined. All the original equipment is still available. That might lead to building generators like this from a variety of materials, which would give a great deal of information about the conductivity of solids, heretofore unknown, which could indicate a pattern of activity for electrons in various materials, making possible predictions about what happens to electron drift velocity at both higher and lower temperatures, amperages, and with varying amounts of resistance. There would probably be some materials that would be best used at high temperatures, others that would be best at low temperatures, and still others that might do well at room temperature.

The possibilities are great that this experimentation begun in 1969 will transform the world.

New Horizons In Electric, Magnetic & Gravitational Field Theory

by
William J. Hooper

(B.A., M.A., Ph. D. (University of California Berkeley); President & Director of Research, Electrodynamic Gravity, Inc.; Professor of Physics Emeritus, Principia College.)

Table of Contents

Preface

Introduction: New Horizons in Field theory

Chapter 1: Fundamental Fields

Chapter 2: The Electromagnetic Force Equation

Chapter 3: Experimental Confirmations by Electrostatic Shielding

Chapter 4: The Motional Magnetic Field

Chapter 5: Gravitation

Chapter 6: Anti-Gravity & Electrical Power

Chapter 7: Some Confirming Experiments

Appendix

This book is dedicated to Mr. And Mrs. Warren W. Gibson, who have made it possible financially to carry on the last two years of fruitful experimental work. The devotion and dedication of Mrs. Gibson (Fran) to this project, serving as secretary and Research Assistant, has provided a flame which has kept it aglow to its present status.

"It appears to me, that the study of electromagnetism in all its aspects has now become of the first importance as a means of promoting the progress of science." (James Clerk Maxwell: *Treatise on Electricity & Magnetism*, Vol. 1, Pref., p. vii.)

Preface

Nearly everyone believes that gravity is a force emanating from matter, but just how, just why, nobody seems to know! In the science of physics much is known about electricity and magnetism, but of gravity, nothing really, with the exception of the inverse square law of Sir Isaac Newton, which we know gravity obeys.

This treatise presents newly discovered unique and startling properties of one of our induced electric fields. It gives this field a new status among our field forces. Its unusual properties are possessed only by gravity. While it is too early to claim complete identification of this field and the gravitational field, the similarities are amazingly alike.

Electricity and Magnetism were once two separate sciences. In 1820, Hans Christian Oersted observed that magnetic flux was always looped about a current-carrying conductor. This discovery served to unite the two sciences of Electricity and Magnetism into one, that of Electromagnetism.

During World War II the writer, working on an invention for a "drift and ground speed meter for aircraft", arrived at a plan for utilizing the vertical component of the earth's magnetic field. If the voltage induced between the ends of two oriented linear conductors traveling horizontally across the vertical component could be measured within an aircraft, a self-contained meter, independent of ground instrumentalities, would be forthcoming. The plan was reviewed by the U.S. Bureau of Standards, and its workability confirmed under a certain restriction. It was stated that the device would be inoperable within a conducting cavity such as a metal-clad aircraft. Our textbbooks have taught us that when a linear conductor moves with a velocity V across a magnetic flux of intensity B, an electric field of vector intensity VxB is induced within the wire and gives rise to a voltage at its terminals. This electromagnetically induced electric field, often called a motional electric field, we have been taught, would be electrostatic in character, that is, identical and indistinguishable from an electric field arising from charges of electricity. We know that radio tubes, silvered on the inside, shield the interior from stray electrostatic fields. In the same way, it was explained, such a drift and ground speed meter within a metal-clad aircraft would be shielded from the electric field induced in a conductor by motion across the vertical component of the earth's magnetic field. This explanation was a jolt to the writer. How could we know, without experimental evidence, that such would be the case? This presented a great challenge! Some of the foremost thinkers in physics were consulted. It was discovered that there was no experimental evidence to support the popular belief held by physicists that the motionally induced V x B field was electrostatic in its fundamental character and therefore subject to shielding. It will be shown how, step by step, the writer has been guided over a period of 20

years to experimental means which at last reveal experimentally, beyond all doubt, the beautiful unique properties of the motional electric field. It is not electrostatic! Its immunity to shielding, magnetic or electrostatic, is the exciting property which it shares with the gravitational field and thereby indicates their kinship. By a general theorem in electric field theory we know that a non-uniform B x V field must also act attractively on matter! Thus the motional electric field has acquired a status which makes it quite unique.

Guided by theory the inventor has built a generator of the B x V field which projects its field into the surrounding space. The writer calls this artificially generated field Electrodynamic Gravity because it simulates gravity. Although utilizing principles of magnetic field superposition and electromagnetic induction, the product field, B x V, like the gravitational field displays no evidence that magnetism plays a part in its generation. Likewise it is free of electrostatic characteristics. Although magnetic flux is moved by the generator, there are no mechanically moving parts.

The guiding concept employed by the inventor was first set forth in 1957 by E. G. Cullwick (*Electromagnetism & Relativity*, p. 245, Longsman Green & Co.). His research had led him to the conviction that the magnetic flux loops discovered by Oersted were actually in motion along the linear conductor in the direction of the electron current giving rise to it, and moved with the electron drift velocity. Our motional electric field generator demonstrates the correctness of the foregoing prediction. Its operation makes use of this movement of flux to generate the B x V field in space about the generator. This confirmation of Cullwick's prediction is an experimental contribution to modern electronic theory and it has all the earmarks of being the welding link which ties gravitation to electricity and magnetism. The oersted flux, first its discovery, and now the discovery that it moves with the electron drift velocity giving rise to it, thus holds a unique role in the process of welding the three sciences into one.

The new generator affords useful instrumentation for directly measuring electron drift velocities in metals, as well as experimentally determining the number of electrons available at various temperatures. Thus, it provides a new experimental method f investigation into the realm dealt with by the Fermi-Dirac statistics. Theoretically, this device holds exciting possibilities of great utility at very low temperatures. If sufficiently intense fields can be obtained by the use of superconducting wire in our generator at low temperatures, as we have good reason to believe is possible, the phenomenon of attraction and polarization of materials by this field can be studied. This would immediately bring into the realm of possible experimental demonstration such effects as weightlessness, artificial gravity, and anti-gravitational effects. This achievement, the writer believes, will be no more difficult of attainment than that which has already been demonstrated experimentally.

Should success follow the forthcoming planned cryogenic (low temperature) experiments and we find that very intense B x V fields can be generated and identified with the gravitational field, the promise of utility to humanity would be beyond all description. Free electric power from the earth's gravitational field would be obtainable anywhere, under the sea, on earth or neighboring space, on the moon or the planets! Gravity-free laboratories on earth, and artificial gravity in spacecraft --- these are some of the possibilities! With such promises on the horizon it is difficult for the writer to rest on his oars for one minute. This treatise therefore goes forth with "Great Expectations!"

Sarasota, FL (December 1969)

Introduction

New Horizons In Field Theory

Forty years have passed since Max Mason and Warren Weever wrote in their celebrated book, *The Electromagnetic Field* (1 ~ p. xii, Univ. of Chicago Press, 1929):

"The great scientific task of the next 50 years is the development of a new electromagnetic theory. It is impossible to forecast the form such a theory will take, so greatly are we prejudiced by our present views. It will, however, doubtless be based on a quantitative description of the individual behavior of charges"

The new physics under the leadership of such men as Einstein, Planck, Heisenberg, Schrodinger, and Bridgman, has produced a series of kaleidoscopic changes in classical concepts. The contributions of the first four of these five men have been well incorporated into our modern textbooks. It is the work of Bridgman, his philosophy as embodied in "The Logic of Modern Physics" (2 ~ MacMillan Co., 1928), and paraphrased as "The Operational Viewpoint", which has to a large extent inspired this treatise, and provided a beacon of illuminated thinking to guide contemporary physicists in the development of new ideas. What Bridgman has done is to show us how the advent of relativity theory has made it necessary to take cognizance of the fat that new phenomena spring into existence as the result of introducing into an experiment nothing more than motion or a change in motion. We must be aware of assuming that because of the fact that similarities exist between old and new phenomena that they are necessarily equivalent. To be specific, let us again turn to Mason and Weaver:

"It cannot be urged that it has been shown experimentally that moving particles and changing currents are rigorously equivalent as regards induced electromagnetic forces. It is very easy to let the notation carry the burden of the argument and to hold that the value of curl E s related to the rate of change of B in every case in the way stated by the equation (curl E = -?B/?t). It is very important to point out, however, that by doing so one may be overlooking something of fundamental physical importance." (3 ~ ibid., p. 257)

It is this "something of fundamental physical importance" which is overlooked when the so-called "principle of equivalence" is applied without rigorous examination and analysis. This is the very essence of Bridgman's thesis.

There is no evidence that the subject matter of electromagnetism, since its earliest inception, has ever been given the Bridgman treatment. If we desire to keep our future growth on solid scientific ground, we are faced with the necessity of review and revision of old and new concepts which dominate thinking in the direction of its inevitable expansion. We need much to learn how "greatly are we prejudiced by our present views". In order to make way for the next great breakthrough in physics we must first come face to face with facts that reveal how greatly our present concept of fields is restricting our thinking and limiting our achievements.

An example of one of the greatest blind spots in current popular field theory will illustrate this point. This blind spot, due to an assumed concept, has been upheld by some of our most brilliant mathematical physicists. So dogmatic and completely certain of the accuracy of his position was one that he contributed the following jingle with which to support his conviction:

"There is but one God Allah, And Mohammed is his prophet! There is but one electric field E, and Maxwell is its prophet!" (4 ~ J. Stepian, "Electrostatic or Electromagnetically Induced Electric Field?"; *Scientific Paper* 1451, Westinghouse Research Laboratory, 7-14-49)

That nature has provided us with but one field agency which accelerates electrons, one electric field, and that one electrostatic in its fundamental character, is perhaps the greatest of all our current prejudiced and erroneous views. None of Faraday's famous experiments show or prove

the existence of but one electric field in nature. It is Maxwell's translation of these experiments into the language of mathematics that bear the tacit assumption of only one such field. But Faraday left us a word of warning:

"and considering the constant tendency of the mind to rest on an assumption, and, when it answers every present purpose, to forget that it is an assumption, we ought to remember that, in such cases, it becomes a prejudice, and inevitably interferes, more or less, with clearsighted judgment." (5 ~ *Phil.Mag*., 1844)

It will be shown with experimental and theoretical proof that this assumed and prejudiced view is incorrect. Indeed, it is as obsolete as the concept of the atom as being a single indivisible particle, and as obsolete as the concept of a single atom for each element. It is as unrealistic as were the arguments of the famous Professor Simon Newcomb, recipient of honorary degrees from ten European and seven American universities, who was demonstrating mathematically that man could not fly, while the Wright brothers were assembling their aircraft at Kitty hawk. Simply because it can be shown mathematically that an electrified particle will trace identical trajectories in each of two types of fields, is no proof that these fields, these accelerating agencies, are equivalent and identical. Penetrating properties of fields, rendering them immune to shielding, possessed by some and not by others, have no mathematical representation in such so-called proofs, hence the proof is not rigorous because it does not include all the field properties.

A second modern prejudice, an assumed concept, which has gained considerable popularity, is one which states "the whole concept of a magnetic field is a fiction." (6 ~ P. Moon & D.E. Spencer: "Electromagnetism Without Magnetism: An Historical Sketch"; *Amer. J. Phys.,* vol. 22, p. 120, 1954)

By combining two conceptual prejudices, "one electric field" (or its equivalent, electric charges only) and "no magnetic field", Moon and Spencer have produced what they call "A New Electrodynamics" (7 ~ *J. Franklin Inst.* vol. 257: p. 369, 1954) which appears on the surface to have revamped the whole picture of electromagnetism, in which no reference is made of fields, and the formulation is in terms of charges and their motions only. It would appear upon first examination that the success of their endeavors would constitute a basis for establishing the verity of the two basic assumptions. But this is not the case, as will be shown. The Bridgman treatment of Maxwell's equations clarifies the paradoxes and ambiguities previously associated with them and in so doing it retains the intrinsic values found in electric and magnetic field concepts (8 ~ P. Moon & D.E. Spence: "Some Electromagnetic Paradoxes", *J. Franklin Inst*., vol, 260, p. 373, 1955). Both the Maxwell equations and the "New Electrodynamics" formulation take on new meanings when analyzed in the light of the Operational Viewpoint urged by Bridgman. We will go into this subject in the next chapter.

Wile Moon and Spencer claim that the complete elimination of all reference to electric and magnetic field concepts in their formulation brings it to "a closer contact with reality", to the writer, this constitutes rather a fleeing from the reality of fields by burying one's head in sand, like an ostrich, wherein only sand particles can be seen, and one's body remains in a variety of teeming dynamic forces.

The idea that magnetism may not have physical reality because electric currents which give rise to certain aspects of it may be replaced in the equations by moving charges has been given much consideration. Page and Adams in discussing elementary charge and the force equation state:

"It is often stated that no magnetic charges exist in nature, and that therefore the terms in $?_H$ in this equation are without physical significance. On the contrary, we shall show that, if every elementary charged particle contains electric and magnetic charges in the same ratio, no

electromagnetic experiment can reveal the value of ? --- therefore the field equation and the force equation become identical in form with the equations obtained on the assumption that only electric charge exists in nature. There is no experimental evidence, therefore, to justify the common assumption that only electric charges and no magnetic charges are present in the world of experience. If the reverse were true, or if electric and magnetic charges occurred combined in any fixed ratio, all electromagnetic phenomena would take place in exactly the same way. No electromagnetic experiment would reveal the proportions in which the two types of charge might exist." (9 ~ Leigh Page & Norman Adams: *Electrodynamics*, pp. 210-211, Van Nostrand & Co, 1940)

The concept of electric and magnetic fields possessing intensities and directions, susceptible to direct experimental measurement and mapping, is one of the most fundamental and elemental realities of electromagnetism. True it is that perplexing and incongruous problems in field theory, heretofor seemingly unsolvable, have plagued it, and indeed these problems are largely responsible for the current trend to avoid field theory, especially magnetic, wherever possible. It is right in this area that Bridgman's Operational Philosophy comes to our rescue and affords a solution which is both satisfying and illuminating.

Electric and magnetic fields are manifestation of force, and force is always associated with energy. Our understanding of the energy nature of electric and magnetic fields up to the present time appears clouded and uncertain. A clear adequate description has not been found by the writer in any contemporary text. In place thereof is found confusion worse confounded. In order to fully comprehend the significance of this treatise we must have some acquaintance with the present status of our knowledge of fields, both energy-wise and otherwise. A glimpse of this state of affairs may be gained from a few quotations from *The Electromagnetic Field* (10 ~ Mason & Weaver, *op. cit*., pp. 266-269). Speaking of the special density of electric and magnetic energy and of the Poynting Vector which measures the flux of energy at any point, we read: "The authors do not pretend to understand these concepts, but discuss them as adequately as they are able". They further say that they "are not able to ascribe any significance whatever to the phrase 'localized energy'". Nothwithstanding these views, they state, "The hypothesis of a spacially distributed electrostatic energy of volume density ha, however, played a large role in the development of electromagnetic theory" (11 ~ ibid., p. 162). And again, "in both electrostatics and magnetostatics, energy densities in space have, to be sure, been calculated" (12 ~ ibid., p. 269). It is an object of this treatise to completely clarify this area of electric and magnetic field energy.

Energy, in the many forms it assumes, appears today to play a leading role in the great drama of physical science. Whether it is kinetic or potential, mechanical, electric, magnetic, electromagnetic, binding energy of nuclear structure, or any other of its myriad manifestation, it is some form of energy, pure or bottled up in particle form, which we encounter and cognize at every turn in this physical world. Everything in the material universe is some form or manifestation of energy.

In the light of fundamentals it would seem most natural that a proper scientific description and classification of anything would include terms which reveal its energy nature, or status with respect to energy. In a comparison of one thing with another, one recognizes as a mere self-evident truism the fact that for any two things to be identical in nature, they must necessarily be identical from an energy standpoint, and this truism especially applies to force fields, both electric and magnetic.

This treatise will especially concern itself with one of the most important underlying properties of one of our electric fields, the "motional electric field B x V" and its immunity to shielding. It will present new theoretical and experimental knowledge which must have consequences of vital importance to the science and philosophy of modern physics. The picture presented will be based entirely upon conceptions of electromagnetic theory which are found in complete agreement with experiment. This picture, it is believed, will reveal not only the cause of many of our difficulties, but the way out of them. It will reveal a vista of new opportunities for research. It is confidently believed that as a result of the clarified picture thus attained, new horizons in field theory are in the offing. A glimpse of these horizons, together with an electromagnetic theory of gravitation leading up to the derivation of Newton's Inverse Square Law, will be presented with experimental proposals for its verification. Finally the subject of antigravity will be discussed and, in the light of this thesis, how a practical approach to this problem is clearly indicated with its thrilling possibilities.

Chapter 1

Fundamental Fields

Webster defines science as "knowledge classified and made available in the search for truth". A correct classification of knowledge thus becomes the basic foundation of a science. The word classification has been underlined by the writer, because of its great importance. A wrong classification of anything can result in greatly impeding the progress of the branch of science in which it exists. Thus great treasures in science can be hidden and obscured for ages until some prospector comes along and reveals its true nature. A critical survey of the present status if electrodynamics reveals a considerable number of electric and magnetic fields which are brought into being by operations which are unique and seemingly unrelated. So entrenched is the present tacit assumption of physicists that nature has provide nature with one and only one electric field and one and only one magnetic field that no pioneer has as yet attempted to seriously penetrate this prejudice and venture into the possibilities of classification which might bring law and order to some of our current problems.

The advent of relativity theory was instrumental in forcing physicists to reexamine and alter many of their most cherished and fundamental concepts in physics. Consdier, for instance, the concept of time. None other than the great Sir Isaac Newton has defined time, in his *Principia*, in the following manner:

"Absolute, True, and Mathematical Time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called Duration."

Bridgman points out with great clarity that f we examine the definition of absolute time in the light of experiment, we find nothing in nature with such properties. By example after example he points out that many of the stumbling blocks which have clogged the progress of physics, and then he does something about it. He has contributed what is called the Operational Viewpoint as a guiding beacon to enable us to avoid making these kinds of mistakes in the future. In brief, he tells us what we should define and classify our concepts in terms of the operations which are necessary in order to detect and measure them, and not in terms which have no counterpart reality in nature, no direct experimental evidence to support them. Only as we do this, he points out, can we avoid treacherous pitfalls and embarrassments in the future growth of our science. He states, "It is evident that if we adopt this point of view toward concepts, namely that the proper definition of a concept is not in terms of its properties but in terms of actual operations,

we need run no danger of having to revise our attitude toward nature. For if experience is always described in terms of experience, there must always be correspondence between experience and description of it, and we need never be embarrassed, as we were in attempting to find in nature the prototype of Newton's absolute time" (13 ~ Bridgman, op. cit., p. 6). While stating that "operational thinking will at first prove to be an unsocial virtue", he nevertheless predicts that, "In this self-conscious search for phenomena which increase he number of operationally independent concepts, we expect to find a powerful systematic method directing the discovery of new and essentially important physical facts" (14 ~ ibid., p. 224).

The writer has classified operationally the three most prominent electric and the three most prominent magnetic fields which we find in nature. They are as follows:

Fundamental Electric & Magnetic Fields (m.k.s. units)

(1) $E_c = Qr/4 \pi e_o r^3$

The electrostatic or Coulomb field arising from the presence of charges

(2) $E_m = v \times B_s$

The motional electric field which acts on charges traveling with velocity V across a magnetic induction B_s. This field is produced by flux cutting and should not be confused with E_t arising from flux linking

(3) Curl Et = $?^B/?^t$

or Et = $?\underline{A}/?t$

$$\text{Curl } \bar{E}_t = -\frac{\partial \bar{B}}{\partial t}$$

$$\text{or } \bar{E}_t = -\frac{\partial \bar{A}}{\partial t}$$

The electric field E_t, in this formula arises from flux linking, or transformer electromagnetic induction discovered by Henry and Faraday. In this field B changes intrinsically with time. $\underline{A}$ is the magnetic vector potential.

(4) Curl $H_s = J$

This magnetostatic field H arising from a conduction current density J within a conducting medium was first discovered by Oersted. It is at rest with respect to the current circuit source producing it.

(5) $H_m = -v \times D_c$

The motional magnetic field arising from relative velocity v with respect to electric charges producing the electric induction D_c.

(6) Curl $\underline{H}_R = ?\underline{D}c/?t$

$$\text{Curl } \bar{H}_R = \frac{\partial \bar{D}_c}{\partial t}$$

The magnetic field H_R surrounding a changing electric induction called a displacement current. This magnetic field plays a prominent part in the production of electromagnetic radiation. It was first theoretically predicted by Clerk Maxwell.

Particularly illuminating is the analysis of Cullwick with respect to the salient operational differences in the sources of the three types of electric field E_c, E_m and E_t (15 ~ E. Geoffrey Cullwick: *The Fundamentals of Electromagnetism*, p. 285; Cambridge Univ. Press, 1949). In brief, he pictures them as follows.

All electromagnetic phenomena applied in electrical technology have, as their fundamental basis, the mutual forces experienced by electric charges, and we have seen that these arise in three ways:

E_c ~ Two charges experience mutual forces in virtue of their positions. This is the electrostatic force of attraction or repulsion.

E_m ~ They experience additional forces in virtue of their velocities. Thence arise the forces experienced by a conductor carrying a steady current in a constant magnetic field, the forces between current-carrying conductors, and the induction of en emf in a conductor moving relatively to the source of a magnetic field.

E_t ~ They also experience additional forces by virtue of their accelerations, from which arise the induction of an emf by transformer actions, and electromagnetic radiation of energy.

The thing we are especially interested in, in this thesis, is that each of these unique operations with charges brings into existence a new force field which will act upon charges of electricity to accelerate them. The intensity of an electric field is defined at a point as the force per unit of charge will be exerted. The great mistake of the past has been the assumption that each of the above accelerating agencies are, in their intrinsic physical natures, in every way equivalent and identical since they each produce the same end product, the acceleration of a charged particle. Now in my human experience I may desire to move across a lake in a boat. As accelerating agencies I may select several which are one unique: (a) a set of oars, (b) a sail, (c) an outboard motor, (d) an engine-driven air propeller.

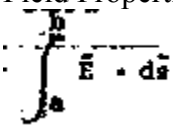
There is no question with respect to the uniqueness of these agencies in spite of the fact that each one produces the same end result --- namely, a force on the boat. Because we cannot cognize directly the unique accelerating agencies in electrodynamics by means of the five physical senses, they have been assumed to be all alike in nature, in spite of the known fact that operationally they arise from manipulations which are as uniquely different as in the case of the three accelerating agencies applied to the movement of a boat.

Had Bridgman's Operational Theory been published at an earlier date, it is dubious that the present popular view of these electric and magnetic fields would be as they are. Why? Because the three electric and the three magnetic fields listed above are each one produced by operational means which are experimentally just about as different as they could possibly be. This fact alone should be sufficient to challenge complacency and initiate a searching investigation of the facts. Contrary to popular belief, each one of these fields is unique in nature. It is self-evident that each of these six fields requires unique operations necessary to produce, detect, and measure it. Both theoretical and experimental evidence will be presented to show that at least some of our conceptions of these fields are fundamentally misconceptions, and in these cases the misconceptions are due to the fact that these fields are unique in nature, each one possessing characteristic properties of is own which entitle it to a distinct identity in nature. This discovery must inevitably render a great service in clarifying the confusion existent in the present state of our knowledge, and afford new opportunities for research, new possibilities in applied physics and new horizons for a unified field theory. An analysis of the properties of these fields will next be considered so that their unique properties may be apparent.

Table 1 has been prepared to show the outstanding differences in the properties of each of the first three operationally different electric fields. The recognition of the uniqueness of each field is aided by a comparative study of these properties. The properties of the electrostatic field are well known and need no elaboration in this treatise. Scientific literature dealing with this field is replete with its well-known characteristics.

Table 1: Field Properties

Field Properties: (1) Spatially distributed energy; (2) $\emptyset_E = d_s$; (3) Curl E ; (4) $?_a^b E = d_s$



; (5) E =dV/ds Potential function ; (6) Behavior with respect to shielding; (7) Div. E ; (8) Poisson's fundamental law with respect to the interior of conductors; (9) In conductors carrying current; (10) Inverse square law; (11) Spatial nature of field; (12) Relation to charges in it; (13) Field dependence; (14) Functional dependence on velocity.

Electrostatic Field: E_s ~ (1) $KE^2/8$ pi ergs/cc; (2) = 0 always; (3) = 0 always; (4) a constant always; (5) Yes; (6) Can be readily shielded with conducting material; (7) = 4 pi *p*; (8) Obeyed; (9) Conductors always have a surface charge; (10) Yes; (11) Continuous throughout space it occupies; (12) Charges within it produce a distortion of the field; (13) A primary field independent of all other fields; (14) Intensity of electrostatic field in any reference frame is parabolic function of v/c.

The electric field induced by a changing magnetic vector potential: Et = -dA/dt ~ (1) $KE^2/8$ pi ergs/cc ; (2) $\neq 0$ in general; (3) = -dB/dt; (4) Not a constant. Dependent on the path of integration; (5) No; (6) Can be shielded with sufficient thickness of shielding; (7) = 0 always; (8) Not obeyed; (9) Can drive a current without a potential drop along the wire; (10) No; (11) Continuous throughout space it occupies; (12) Charges within it do not distort the field; (13) Dependent upon another field; (14) ---.

The motionally induced electric field: E_m = V x B ~ (1) No spatially distributed energy; (2) $\neq 0$ in general; (3) = v x (v x B) $\neq 0$ in general; (4) In a perfectly uniform B the value of the integral between 2 points *a* and *b* will not be dependent on the path, will be independent of it, but in general this will not be true; (5) May or may not be a potential function; (6) Immune to shielding; (7) = 0 always; (8) Not obeyed; (9) Can drive a current without a potential drop along the wire; (10) By special design yes in certain portions of field; (11) Only present at points where moving charges exist; (12) Charges within it do not distort the field at all; (13) Dependent upon another field; (14) Intensity of motional electric field in any reference frame is linear function of v/c.

In order that the unique character of each of the electromagnetically induced fields may be understood, considerable discussion will be required in view of the fact that so many texts emphasize the similarity of these fields in certain instances and fail to point out the vital, outstanding differences in their fundamental properties, which make it impossible for them to be identical in nature. Some of these differences have been revealed in scientific literature (16 ~ G. I. Cohn: *Electrical Engineering* 63: 441, 1949; E. G. Cullwick: *The Fundamentals of Electromagnetism*, pp. 84-87, Macmillan Co., 1939; W.V. Houston: *American Physics Teacher* 7: 373, 1939; Page & Adams: *American Physics Teacher* 3: 57, 1935)) but do not as yet seem to

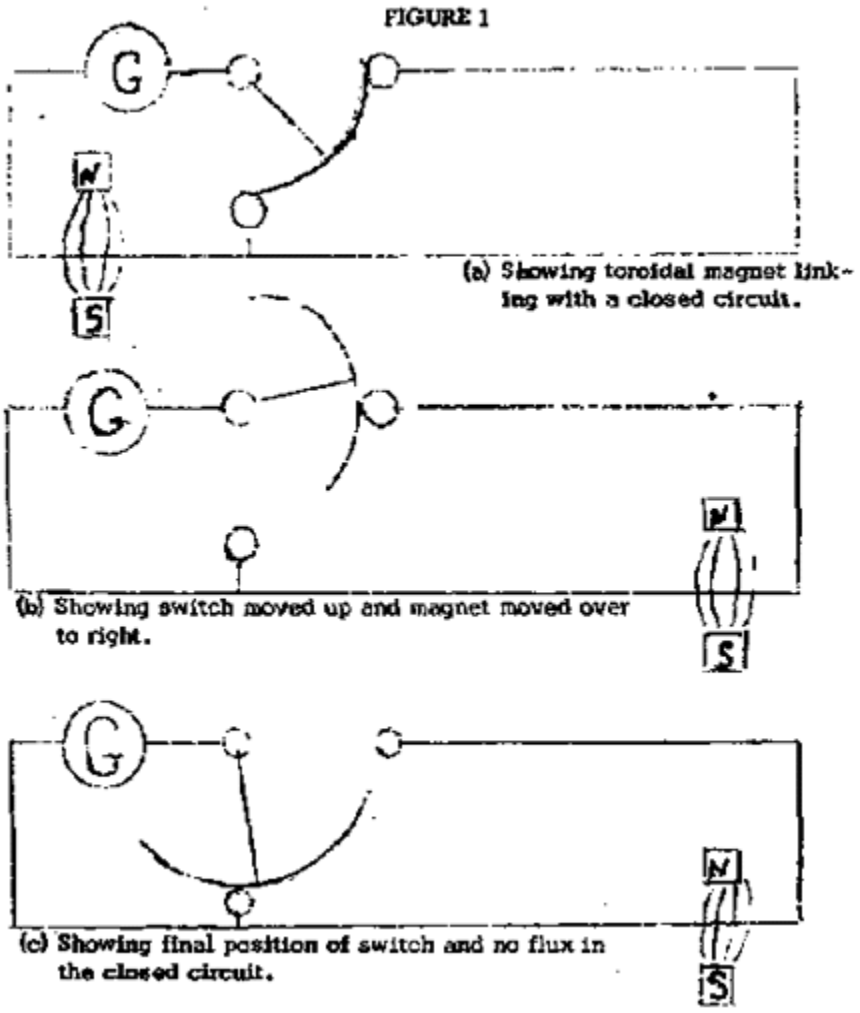
be generally incorporated in our textbooks. Cohn, in particular, has rendered an outstanding contribution…

[missing text?]

different ways of expressing one and the same fundamental phenomenon is because it is basically incorrect. Not only are the two types of field Em and Et fundamentally different and each one unique in nature, but an examination of the Faraday Lay, E.M.F. = -dN/dt, reveals that this equation itself does not hold true in general. In other words, it has been shown that the flux linking with a closed circuit can be either partially or completely removed from the circuit without inducing any electromotive force whatsoever! 17 ~ G. I. Cohn: *Paradoxes of Electromagnetic Induction*; Thesis, Illinois Inst. of Technology Library)

This can be accomplished by a cleverly designed switching circuit, one version of which is shown in Figure 1. This illustrates the fact that the flux linking with a closed circuit may be changed by three different unique operations: (1) Flux cutting, (2) Flux linking caused by -dB/dt, where the source of B is intrinsically changed with time, and (3) A uniquely designed switching circuit. Only the first two sets of operations produces an emf. The third set of operations produces no emf and for this reason the present manner of presenting Faraday's Law is invalid. There are two unique operational methods of inducing an emf, and we should not endeavor to derive them from one simple mathematical expression -dN/dt, because this expression includes or implies operations which will not induce and emf. It is therefore obsolete! As Cohn and others have shown, there are actually two kinds of electromagnetic induction and in general case both types are involved and each must clearly be understood and differentiated from the other. That the flux linking law, attributed to Faraday, does not hold for his own Faraday-disk unipolar generator, which requires the flux cutting law for its correct descriptive behavior, is perhaps one of the most outstanding examples of how vitally unique and essential is the role of each law and each of the corresponding electric fields produced by these laws.

Figure 1



In the Faraday generator there is no time rate of change in the magnetic induction B, since it originates from a permanent magnet and is constant. The circuit can even be made so as to link with no flux whatsoever. In any case, there is no change of B with time. This very fact that all contemporary authorities (18 ~ Slater & Frank: *Electromagnetism*, p. 86, McGraw-Hill, 1947) on this subject have found it necessary to add the flux cutting law to the famous Maxwell equations in order to satisfactorily explain all cases of electromagnetic induction is itself indicative of the uniqueness of the electric field so produced.

Many of my colleagues have said that it was not difficult for them to distinguish fundamental differences in the Coulomb field E_c and the magnetically induced fields E_t and E_m, but they were unable to see any clearly defined difference between the E_t and the E_m field. Let us, therefore, discuss some of the most outstanding differences between these two fields.

What is our concept of an electric field? Most physicists will reply that it is a force which acts upon an electric charge and tends to accelerate it in a definite direction termed the direction of the field. With this concept in mind, let us analyze the two electric fields E_t and E_m.

In Figure 2 below is shown a cross-section of a long straight solenoid in which a gradually increasing current is flowing counterclockwise.

Figure 2

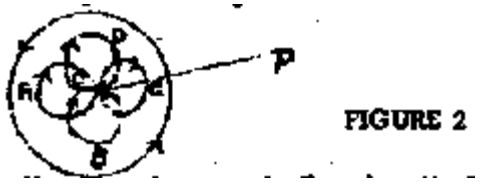


FIGURE 2

The uniformly distributed magnetic flux density B within this area is therefore increasing with time and according to Faraday's law of Electromagnetic Induction, the emf around any closed circuit placed wholly within the area shown in Figure 2 would be given by: emf = dN/dt = ?QE_t-ds where N equals the total flux linking the circuit.

$$e.m.f. = -\frac{dN}{dt} = \oint \bar{E}_t \cdot ds$$

Our interest centers on E_t, the electric field within the conductor of such a circuit, giving rise to the emf. Obviously, Faraday's Law gives us absolutely no information about this field Et other than to say that the line integral of this field around the closed circuit will give us a value of the emf induced in it. If this closed circuit A lies in the plane of the area, Figure 2, then at point P in this circuit, it is obvious that E_t is directed toward the bottom of the paper. If, however, we select the circuit B instead of A, then at this same point P the electric field E_t is directed horizontally to the right. If we select circuit C instead of B, we then find E_t directed toward the top of the paper at P exactly the opposite direction from that in circuit A. And if we select circuit D then E_t at P is directed horizontally to the left, in exactly the opposite direction that it had in circuit B. That an electric field E_t exists in this area there seems to be no doubt since an emf arises within each of these circuits. But this field E_t is very peculiar, since it is impossible to define it at the point P unless we first select a particular circuit through P which will then enable us to determine its direction at P.

Now let us remove the conducting circuits from within the area of Figure 2, and place a stationary free charged particle Q at the point P. Will it move? If so, in what direction will it move? If it remains stationary, and is free to move, then does an electric field exist at this point? Certainly the magnetic flux density exists there and is changing with time, but we have no assurance whatsoever that it will act upon a stationary charge, nor is the direction in which it will act unless it is first given an initial velocity, or unless it is confined within the conducting medium of a closed circuit. No other electric field has this unique operational prerequisite, which in this case appears to require that the charged particle upon which it acts must either have an initial velocity within the electric field, or that it must exist within a conducting circuit before it will make itself manifest. A free stationary charged particle placed within an E_m or E_c field will be immediately acted upon in both magnitude and definite direction. About all that we can say in a descriptive manner of E_t at a point P, such as shown in Figure 2, is that this transformer type field has curl at that point, as shown by Maxwell's formula. For a clarifying conception of just what curl means one will find it helpful to study Skilling's treatment of it where he defines it as the limiting value of circulation per unit area (19 ~ H. H. Skilling: *Fundamentals of Electric Waves*, 2nd Ed., p. 41; J. Wiley & Sons, Inc, 1948). This means simply, as applied to Figure 2, that if a small conducting disk of ink, say a dot made with India ink, were placed at point P, negative electrons would circulate in this dot in a counterclockwise direction. The dot of ink would be everywhere at the same potential, and therefore uncharged. Curl is one of the most

outstanding characteristics of the E_t field which may or may not be possessed by the E_m field, but never by E_c. Now place this same dot of India ink in a uniform E_m field and it will become an electric dipole. The action of a uniform Et field on this dot is therefore very much different from that of an E_m uniform field.

With the exception of mason and Weaver's text, little literature appears to exist which directs attention to the ambiguous nature of the concept of the spatial distribution of energy as concerns the two electromagnetically induced electric fields. That the electric field induced by a magnetic flux intensity which is changing with time has a spatial distribution of energy, whereas the motionally induce electric field does not have any such identical distribution of electric field in space is one of the most crucial of the fundamental differences in their properties. Since the establishment of this fact that these two fields differ radically in their relation to field energy is all-important to the objectives of this treatise, let us now take up a digression at this point.

Insofar as this writer is informed, no one questions the actuality of the special distribution of energy in the case of the electrostatic field or the E_t field, due to a magnetic vector potential intensity varying with time (20 ~ The transformer law is usually stated in terms of the negative time ration of change of magnetic flux linking with the circuit and this gives the total induced emf. The electric field produced by this type of induction is most conveniently designated by the time rate of change of the magnetic vector potential.). Calculations involving field energy in the electrostatic case have long been made without difficulty, and the transfer of energy between the primary and secondary coils of a transformer without any movement of its component parts give direct evidence that electric energy is distributed in the space occupied by the E_t field. The very nature of this electric field requires the concept of the spatial distribution of field energy.

An analysis of the nature of the motional electric field will reveal, on the other hand, that this concept of spatially distributed electric field energy, is not only required for a satisfying understanding of phenomena where this field is involved, but it actually induces basic ambiguities and impossible conceptions.

Let us now examine the origin and basic nature of the motional electric field with its unusual property.

$\underline{E}_m = \underline{V} \times \underline{B}$. This vector field equation was derived by Lorentz from the empirical force formula of Biot and Savart. This is the electric field which is present in the moving wires constituting the armature coils of an electric generator. It causes an emf to exist in a conductor by virtue of motion across magnetic flux. Such induction is called a motionally induced emf or flux cutting emf. As we shall see, this field has some of the most unusual and interesting properties conceivable. Page and Adams have emphasized one of these unique properties. They point out in the case of the generator with a rotating armature coil that this field, "exists only in the moving conductor" --- where moving electric charges are present --- "since no electric field is present in the observer's reference frame" (21 ~ Page & Adams, op. cit., p. 16). Let us examine this aspect of the field more closely, for neither the electrostatic field nor the E_t field possesses this property, for these fields can exist in an observer's reference frame, whether a conducting circuit, or conductor, or charge is at hand or not.

Three essential operational ingredients are necessary to bring this E_m field into existence: (1) A constant magnetic induction $\underline{B}$, (2) an electrically charged particle *e* (22 ~ the charged particle may be an electron in a piece of matter, or free as in a gas), a relative velocity $\underline{v}$ between the particle and the reference frame of the magnetic source producing $\underline{B}$. A deflecting force will act upon the particle wherever it moves across magnetic flux lines. As viewed from the reference frame of the particle, this force ($\underline{v} \times \underline{B}$) has many aspects of a real electric field and in fact it is

termed a motionally induced electric field having an intensity ($\underline{v}$ x $\underline{B}$) per unit charge. In the reference frame of the magnetic source giving rise to B only a magnetic field is present. One observes that the moving charge is acted upon by a force which to all appearances is wholly magnetic in nature. Whether we think of it as a deflecting magnetic force or an electric field, it is obvious that it exists only at the points in space where moving charges, either free or in matter, are present, for stationary electric charges are unaffected. In a vacuum, or in space between moving electric charges, no E_m field or deflecting magnetic force exists. Hence it must necessarily have a spotty, or discontinuous nature. How can this be possible?

Let us proceed as Mason and Weaver have suggested by considering "a quantitative description of the individual behavior of charges". Let a positively charged particle with mass *m* and charge *e* be projected into a vacuum chamber with uniform velocity $\underline{v}_o$ at right angles to the direction of uniform magnetic flux $\underline{B}$. The particle has initial kinetic energy $T = 1/2\ m\ v_o^2$. By Ampere's Law, the moving particle (or current element) is surrounded by a concentric distribution of magnetic flux.

Figure 3

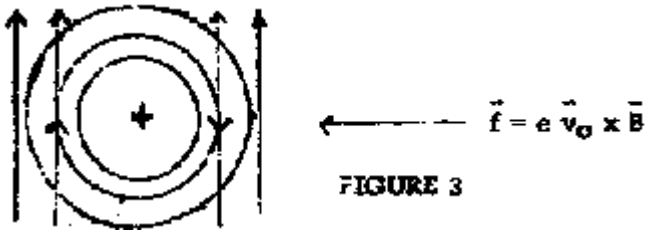


FIGURE 3

It will be acted upon by a mechanical deflecting force $\underline{F} = e\ v_o$ x $\underline{B}$.

It will also be readily seen that this force on the charged particle exists only when there is a magnetic field about the particle. The force is actually the force of lateral repulsion between two magnetic fields. Without the presence of both magnetic fields, no such force exists, hence the existence of $\underline{f}$ requires the simultaneous presence of all three of its essential components, e, $\underline{v}$ and $\underline{B}$. The actual action on the charged particle is magnetic in character, rather than electrical.

Let us next observe that the force $\underline{f}$ always acts at right angles to both $\underline{v}$ and $\underline{B}$. Since the displacement of the particle is always in a direction at right angles to the force, this force can do no work on the charged particle upon which it acts, and no energy is extracted from $\underline{B}$. This force, arising from the magnetic repulsion between two magnetic fields, one due to the moving particle, and the other due to the applied $\underline{B}$, acts like a circular deflecting constraint or baffle, which only changes the direction but not the magnitude of the velocity of the particle. The speed of the particle and hence its kinetic energy remain unchanged. It is well known that such force will cause the particle to travel in a circular path, the radius of which is readily obtained by equating the force Bev_o to the centrifugal force mv_o^2/r and solving for *r*, $r = mv_o/eB$. The particle is thus trapped by the magnetic field, which will hold it to a circular path until its original kinetic energy is dissipated by collisions with neighboring particles, or by radiation.

It is of particular importance to this discussion and is again repeated, that since the deflecting force is always at right angles to the relative velocity $\underline{v}_o$ of the particle and also to $\underline{B}$, no work is done on the particle by the deflecting force.

Whether the particle is confined within the boundaries of a wire or not, ($\underline{v}$ x $\underline{B}$) will always be at right angles to $\underline{v}$ and $\underline{B}$. For clarification let us suppose the particle is enclosed within a

frictionless tube the axis of which is at right angles to $\underline{v}_o$ and to $\underline{B}$. Few further impose the condition the velocity $\underline{v}_o$ of the tube be kept constant in magnitude and direction. Let us examine the behavior of the particle within it. As the tube moves forward, the particle is prevented from moving in a circular path by the walls of the tube, but it can and will begin to move along the axis of the tube under the deflecting action of the magnetic field. To maintain the original forward component of its velocity v_o constant, the external agency moving the tube will have to supply the particle with additional kinetic force in this direction.

As the particle acquires a velocity component v_t along the axis of the tube, the resultant force v x B acquires two components, one along the tube, which will be constant (v_o x B), and one at right angles to the tube (v_t x B), opposing to the forward motion (Lenz's Law). We thus see the that the additional kinetic energy imparted to the charged particle moving down the tube is transmitted to the particle directly by the external force moving the tube. This kinetic energy is continuously channeled along the tube by the deflecting action of the magnetic induction $\underline{B}$ interacting with the magnetic field formed around the moving charged particle and the constraint of the tube itself.

The modus operandi of $\underline{v}$ x $\underline{B}$ is thus seen to be wholly magnetic in character. The conception of this force, when viewed from the standpoint of an observer at rest in the reference frame which is traveling with velocity $\underline{v}_o$, as being an electric field similar in character to that of an electrostatic field is therefore an artificial figment of the imagination which instead of clarifying the understanding of motional electromagnetic induction, often befogs it. The concept of $\underline{v}$ x $\underline{B}$ as an electric field is a convenient mathematical construct, however, for computing induced emf's, but the actual nature of the phenomenon with which one is dealing must be kept clearly in mind to avoid mistakes. The electromotive force induced between the terminals of a short straight linear conductor of length $\underline{l}$ moving with relative velocity across a magnetic induction B is given by the formula:

(Eq. 2) $E = \underline{v} \times \underline{B} \bullet \underline{l}$

whereas that induced in a closed circuit is given by:

(Eq. 3) $E = ? \underline{v} \times \underline{B} \bullet d\underline{l}$

$$\mathcal{E} = \oint \bar{v} \times \bar{B} \cdot d\bar{l}$$

and is often difficult to evaluate. In these formulae the term $\underline{v}$ x $\underline{B}$ represents the direction and magnitude of the fictitious electric field intensity e_m. The energy associated with this field is directly imparted to the charged particles by a mechanical prime mover which produces the relative velocity instead of by an actual electric field.

An important point in the foregoing analysis is that it serves to illustrate the fact that since the E_m field is by its intrinsic nature only the repulsive force between two magnetic sources, that of $\underline{B}$ and that of the moving charge, it cannot exist except a those points where electric charges with magnetic fields about them exist. The E_m field is only at those points where a magnetic field exists that can interact repulsively with the magnetic induction $\underline{B}$.

Therefore, it is evident that there can be no continuous spatial distribution of E_m electric field energy as there is in the case of the E_o or E_t fields. Since no electric E_m field exists in a space without charges, there is no E_m field energy in a vacuum or in free space such as can exist with an electrostatic field. We need to remember this fact when we think of the E_m field phenomenon from the viewpoint of a moving magnetic flux acting on a stationary electric charge. A single

phenomenon when viewed from two different reference frames can appear to be fundamentally different, but such relative viewing does not alter the fundamental basic cause giving rise to it. Since the real basic nature of the v x B phenomenon has not hitherto been exposed in detail and hence is to a large extent currently taught and believed to be of an electrostatic nature by theoretical physicists, it will be worth our while to go into some of the subtle aspects it presents when it is so conceived.

Let us consider the popular view of this phenomenon as presented by most interpreters of relativity theory. The Special Theory of Relativity as applied to electrodynamics states that if we have a uniform electric field of intensity E, due to charges, and a uniform magnetic induction B, due to magnets, both at rest in a reference frame S, then in frame S' moving with uniform velocity v with respect to S an observer will find an electric intensity E', and a magnetic induction B' given in vector notation in absolute gaussian (c.g.s.) units by:

(Eq. 4) E' = ? {E - (1/c) v x B}

(Eq. 5) B' = ? {B - (1/c) v x E}

where ? = 1/? 1 - $(v/c)^2$

$$\vec{E}' = \gamma\left(\vec{E} - (1/c)\vec{v} \times \vec{B}\right) \quad \text{---------- (4)}$$

$$\vec{B}' = \gamma\left(\vec{B} - (1/c)\vec{v} \times \vec{E}\right) \quad \text{---------- (5)}$$

where $\gamma = 1/\sqrt{1-(v/c)^2}$ and $c = 3 \times 10^{10}$ cm/sec.

and

c = 3 x 10^{10} cm/sec.

The current confusion among physicists is that many interpret relativity theory as showing that ? $\gamma \vec{v} \times \vec{B}/c$ v x B/c is an electric field, identical in nature to an electrostatic field. The reader will note that E' is the vector sum of two electric intensities, ?E γ E, which is an electrostatic field, and V(v x B)/c. Added in this manner, many physicists have tacitly assumed that E' and ?v x $\gamma \vec{v} \times \vec{B}/c$ B/c must likewise be interpreted as electrostatic in nature. Jeans, however, points out that nothing in the postulates of the Special Theory require such an interpretation. He states, "the equations may be taken merely as an expressing relations between quantities as measured by one observer S and another S' moving at velocity v relative to S" (23 ~ J. H. Jeans: *The Mathematical theory of Electricity & Magnetism*, p. 606, Cambridge Univ. Press, 1923). Cullwick states, "R is an attribute of the relativity equations, that they do not claim to include any physical interpretation of the phenomena" (24 ~ Cullwick, op cit., p. 119). Smythe states that the forces represented by the added terms "differ from electrostatic forces. One might call these additional forces electrokinetic forces, but as we shall see, they are identical with those we have already called magnetic forces" (25 ~ William R. Smythe: *Static & Dynamic Electricity*, p. 488; McGraw Hill Book Co., 1939).

Winch in his excellent treatise states, "Notice that (v x B) is not an electrostatic field intensity for it is not due to a distribution of charges. We have shown that the line integral of electrostatic field intensity around any closed path is always zero and there is no exception in this case, i.e.,

the electrostatic field intensity set up by the displaced charges integrates to zero around any closed path. ($\underline{v}$ x $\underline{B}$) is due to the motion of the conductor in the magnetic field, and an external agency is feeding energy into the system, and a net amount of work is done by a charge in moving completely around the circuit. Notice also the ($\underline{v}$ x $\underline{B}$) does not exist in the absence of moving charges, because it is the magnetic force on the charges moving with the wire which sets up the electric field intensity" (25 ~ Ralph P. Winch: *Electricity & Magnetism*, p. 536; Prentice & Hall, Inc., 1955).

Notwithstanding such pronouncements, the writer has discussed the subject with many exponents of relativity theory who are quite insistent that all the terms in Equation (4) must be considered identical to, and indistinguishable from, an electrostatic field. A personal letter from a colleague at our National Bureau of Standards also takes this position, as well a several Nobel Laureates with whom he has consulted. And this stand is taken admittedly by these physicists without a single iota of direct experimental evidence with which to support it!

During the early stages of the work on this project, I called on several Nobel Laureates to discuss the worthwhileness of this endeavor, one of whom was the distinguished physicist and authority in the field of electrodynamics, Enrico Fermi, who had delivered a lecture at the 1944 Public Affairs Conference at Principia College. Among the questions asked, two will be of interest to the reader. (1) "If it were ever discovered that the motional electric field v x B/c was unique and not identical to, and indistinguishable from, an electrostatic field, would this discovery be of any great value to our scientific knowledge?" His answer in substance was: It would indeed be of very great significance and consequence. (2) "To your knowledge, do you know of the existence of any direct experimental evidence which confirms the belief that the motional electric field and the electrostatic field are identical in nature?" After considerable thought, his reply was, "Come to think of it, I can recall of no such existent evidence."

It will now be shown that the relativity equations themselves provide a means for obtaining a fuller understanding of the physical nature of the terms they contain. It is important to observe mathematically that in the general case every term of both of these equations (4) and (5) is a function of B where B = v/c. By a binomial expansion it can be readily shown that:

(Eq. 6) $? = [1 + (l/2)\,?^2 + (3/?)\,?^4 + \ldots]$

$$\gamma = (1 + (1/2)\beta^2 + (3/8)\beta^4 + \ldots)$$

Substitution in the two right hand terms of Equation (4) yields

(Eq. 7) $\underline{E}_s = ? = [l + (l/2)\,B^2]\,\underline{E}$

(Eq. 8) $\underline{E}'_m = ?\,[\underline{v} \times \underline{B}/c] = [l + (l/2)\,B^2]\,(\underline{v} \times \underline{B}/c) = B\underline{Bn}$

$$\vec{E}'_s = \gamma\vec{E} = [1 + (1/2)\beta^2]\vec{E} \qquad (7)$$

$$\vec{E}'_m = \gamma\left(\frac{\vec{v} \times \vec{B}}{c}\right) = (1 + (1/2)\beta^2)\left(\frac{\vec{v} \times \vec{B}}{c}\right) = \beta B\vec{n} \qquad (8)$$

where $\underline{v}$ and $\underline{B}$ are taken at right angles to each other and n is a unit vector at right angles to both $\underline{v}$ and $\underline{B}$ and terms of higher degrees that B^2 have been dropped.

Equations (7) and (8) represent respectively the electrostatic, and the motional electric, field components of the resultant electric intensity E' in the reference frame S' moving with uniform

velocity $\underline{v}$ with respect to S. If now $\underline{E}$ and $\underline{B}$ in reference frame S are adjusted so that they are both perpendicular to v and to each other and their intensities fixed at constant values such that:

$E'_s - E'_m = 0$

Then these two electric field intensities will be equal in magnitude and opposite in direction (27 ~ Two large, similar, rectangular, parallel, and vertical plates separated by a distance *d* could be oppositely charged and electrically isolated in *s*. Above and below the air space between the condenser plates two large circular horizontal Helmholtz coils could next be fastened so that when connected in series a constant current through them would produce a uniform vertical magnetic induction B in the space between the condenser plates. Let S' be a frame of reference moving horizontally through this space with velocity $\underline{v}$ at right angles to both $\underline{E}$ and $\underline{B}$.)

A stationary electron in S' will therefore experience no force acting upon it because the resultant electric intensity in this frame is zero. Most relativists claim that under this situation there will be complete cancellation of electric fields. It will be observed that $\underline{E}'_s$ and $\underline{E}'_m$ are parabolic and linear functions of *B* respectively. It will at once be evident that although $\underline{E}'_s$ and $\underline{E}'_m$ can be made equal to each other in magnitude and opposite in direction for any one reference frame S', moving with an assigned value of $\underline{v}$ and a fixed proper adjustment of $\underline{E}$ and $\underline{B}$ in frame S, such that $v = cE/B$, nevertheless such equality of $\underline{E}'_s$ and $\underline{E}'_m$ would be possible for only two frames at the most, for a straight line can cut a parabola in not more than two points. It is thus self-evident that in the general case it would not be possible to make these two oppositely directed fields continuously equal in more than two possible reference frames at the most, by assigning fixed values to $\underline{E}$ and $\underline{B}$ in S. This is a clear-cut case of the simple superposition of two distinct types of fields. If the $\underline{E}'_m$ term represented an electric field which is identical to and indistinguishable from an electrostatic field, then it would have to behave like one, which would require that it vary parabolically with ? instead of linearly. How could there be complete cancellation of fields in a particular frame if there is a real difference in their intensities manifest in the reference frames having both greater and lesser velocities than this particular frame? Surely such a situation calls for fields which are distinct and unique, balanced against each other with a zero resultant in one (or possibly two) particular frames, but not in neighboring frames of reference.

The $(\underline{v} \times \underline{B})/c$ term most clearly simulates the characteristics of an electrostatic field when it is isolated by itself, without the presence of a resultant magnetic induction! It is this case which has been mostly responsible for the popular belief that the two fields are identical in nature. To simplify the picture, let us first assume a vertical uniform magnetic induction $\underline{B}$ in frame S and no electrostatic field present. In the reference frame S', moving with uniform horizontal velocity $\underline{v}$, with respect to S, an observer will discover a horizontal electrical field, $(\underline{v} \times \underline{B})/c$ and a vertical magnetic induction $B' = \underline{B}$ (assuming velocities small with respect to c), the path of a free electrified particle in frame S' under the action of the two fields which are at right angles to each other will be that of a cycloid traced on a horizontal plane. The path of the particle as seen in frame S would be circular, as previously shown. This motion projected on frame S' moving with velocity $\underline{v}$, is that of a point on the circumference of a circle rolling in a horizontal plane along a line in the direction of $-\underline{v}$. If we now superimpose a uniform magnetic induction $\underline{B}''$ equal in magnitude and opposite in direction to $\underline{B}'$, in frame S', then in this frame we will have only the isolated electric field $\underline{v} \times \underline{B}/c$, with the resultant vertical magnetic induction of zero intensity. Now this electric field very greatly simulates that of an electrostatic field, and it is readily understandable that many physicists have so interpreted it. The path of the particle in this field is now rectilinearly in the direction of $\underline{v} \times \underline{B}/c$ in S', and parabolic as seen from S. Furthermore, since the curl and divergence of $\underline{v} \times \underline{B}/c$ in S' are both zero, as they are in the case of a uniform electrostatic field, mathematicians can call upon what is known as the identity theorem as a proof

that the E_m field is identical to an indistinguishable from an electrostatic field. This proof amounts to nothing more than saying that the dynamic behavior of a charged particle will be the same in both fields. In the following chapters we will show experimentally that this is not always true. Also analysis shows that a prime mover is required for moving the source of B" and supplies energy to the particle continuously.

Let us again analyze this case carefully because of its great importance. Kinetic energy is imparted to a free charged particle and gives it a velocity v_o with respect to frame S. At the commencement of its motion the particle is at rest in frame S', which is moving with the same velocity. It appears to an observer in this frame that the particle starts from rest and begins to move in the direction of $(\underline{v}_o \times \underline{B})/c$. If the magnetic induction is S' is only that due to $\underline{B}$, then its motion $\underline{v}'$ with respect to S' will produce a new deflecting intensity $\underline{v}' \times \underline{B}'/c$ in frame S' in the direction of $-\underline{v}_o$. If, however, the equal and opposite magnetic induction $\underline{B}''$ is introduced in this frame, the effect would be to produce another deflecting intensity $\underline{v}' \times \underline{B}'/c$ which would be equal and opposite in direction to the intensity $\underline{v}' \times \underline{B}''/c$. At this point one needs to think carefully. The deflecting intensity $\underline{v} \times \underline{B}'/c$ in S' directed against the forward motion of the particle arises by virtue of Lenz's Law. The force on the particle due to this intensity will act continuously as long as the particle moves at right angles to v_o. To enable the particle to maintain constantly it original forward velocity v_o, the kinetic energy which is being channeled at right angles to v_o must be continuously replaced. To do this, work must be done continuously upon the magnet giving rise to B" in S', because the action of B" on the particle is to assist its forward motion with respect to S in exactly the same amount that $\underline{v} \times \underline{B}'/c$ depresses it. Two magnets are involved in this action. (1) The magnet giving rise to B' in S' and which is at rest in S. (2) The magnet giving rise to B" in S' and which must be continuously supplied with energy from a prime mover.

The particle can thus be made to travel rectilinearly in S', in the direction of $(\underline{v}_o \times \underline{B})/c$ provided energy is continuously given to it via the role played by B". This is the situation which appears on first inspection to be exactly like an electrostatic field. A free electron originally at rest in S' will be accelerated rectilinearly in S' at right angles to v_o. The electron is seemingly without contact with any material body, hence the electric field $(\underline{v}_o \times \underline{B})/c$ appears to be the only source of its steadily accumulating kinetic energy. The energy would appear to have come from a spatial distribution also as in the electrostatic case, since $(\underline{v}_o \times \underline{B})/c$ is the only electric field present in S', and the resultant magnetic induction is zero. This appearance is exceedingly deceptive and is the basis of this current false assumption with respect to the motional electric field. No prime mover is required in the electrostatic case! The energy in this case comes from the field itself.

In the first place, we must remember that an electric field of the type $(\underline{v} \times \underline{B})/c$ cannot of itself impart energy to the electron because its line of action is always normal to the velocity of the electron with respect to S, and to the direction of $\underline{B}$. We will remember in one of our previous discussions, that this deflecting intensity was shown to channel the kinetic energy of the particle down a tube without itself imparting energy. The function of the tube actuated by a prime mover was to continuously supply to the particle the energy to so channel and prevent the particle from taking up a circular path in S or a cycloidal path in S'. We now discover that the superposition of a magnetic induction B" in S' accomplishes the same thing that the tube did. But this accomplishment can only be achieved by feeding energy to the particle continuously in the forward direction as the tube did and this is done by a prime mover acting on the magnet giving rise to B".This magnetic induction B" interacts with the magnetic field around the charged particle so as to continuously push the particle in the forward direction v_o, thus replacing continuously the kinetic energy channeled at right angles by $(\underline{v}_o \times \underline{B})/c$ and thus keeping the velocity of the particle in this forward direction constant, thereby making its path in S' one that is

wholly at right angles to $\underline{v}_o$. A prime mover gives kinetic energy to a magnet, and its magnetic field pushes on the magnetic field around the particle, and thus does work continuously, which in frame S' appears as increasing kinetic energy of the rectilinear motion of the charged particle. No magnetic field energy is used up in this transfer of energy to the particle. The magnetic field of the magnet is a physical part of the magnet which pushes against the magnetic particle with exactly the same force that the tube did in our earlier description. It performs the same function as that of the tube. There is no real electric field involved in this picture except that around the charged particle, which when moving (by Ampere's Law) gives rise to the magnetic field around it. Thus the whole action of an isolated ($\underline{v}$ x $\underline{B}$)/c field on a charged particle, instead of being electrostatic has a description which is essentially the direct transfer of mechanical kinetic energy from prime movers to the particle. No spatially distributed motional electric field energy enters the picture of this field. The uniform and relative motion of two magnets with equal and oppositely directed fields and the presence of an electric charge released with kinetic energy from its position of rest in the reference frame of one of the magnets produces a combination of pushing and deflecting magnetic forces which causes the particle to behave as though it were in an electrostatic field. This should not surprise us. What should surprise is that physicists should have assumed, without direct experimental evidence, that these combined magnetic forces could be identical to and indistinguishable from an electrostatic field. A monkey and a man are two distinctly different agencies (we hope)! They can, however, exert identical forces on one and the same object, and if oppositely directed hold the object in equilibrium. But surely no one will use such an argument as evidence that a monkey is a man, or that a man is a monkey! Such, however, appears to be the nature of some arguments that ($\underline{v}$ x $\underline{B}$)/c is intrinsically electrostatic. Cajori states: "The unscientific physical speculations of Aristotle held the world bound within their grasp for two thousand years; the unfortunate corpuscular theory of Newton controlled scientific thought for over a century" (28 ~ Florian Cajori: *A History of Physics*, p. 101, Macmillan Co., 1922).

It has taken over a century to pierce the fog created by the assumption of one, and only one, electric field by Maxwell. This assumption having served him well in formulating his beautiful electromagnetic equations, nevertheless became a prejudice, and interfered, more or less, with clear-sighted judgment.

Chapter 2

The Electromagnetic Force Equation

Three outstanding electric field intensities when added together vectorially, constitute what has been termed the electromagnetic force equations (in kms unts):

(Eq. 9) $E = E_c + E_m + E_t = C\underline{r}/4?e_o r^3 + (\underline{B} \times \underline{V}) - ?\underline{A}/?t$ (29 ~ Cullwick, op. cit., p. 287)

$$\bar{E} = \bar{E}_c + \bar{E}_m + \bar{E}_t$$

$$= \frac{C\bar{r}}{4\pi e_o r^3} + (\bar{B} \times \bar{V}) - \frac{\partial \bar{A}}{\partial t}$$

In their *A New Electrodynamics*, Moon and Spencer derive a new formulation for this equation based entirely on the force between two charged particle Q_1 and Q_2 (30 ~ Moon & Spencer, op. cit., p. 369). These authors show that all possible electric intensities can be exerted by charge Q_1

and Q_2 due to (a) constant Q_1, no relative motion, (b) constant Q_1, uniform relative velocity, and (c) constant Q_1, accelerated motion, when added become respectively:

$$\bar{E} = \bar{E}_c + \bar{E}_m + \bar{E}_t$$

$$= \frac{\bar{F}}{Q_2} = \frac{Q_1 \bar{r}}{4\pi\epsilon_0 r^3} + \bar{D}_r \frac{Q_1}{4\pi\epsilon_0 r^2}\left(\frac{v}{c}\right)^2 \left[1 - \frac{3}{2}\cos^2\theta\right] - \bar{a}_a \frac{Q_1}{4\pi\epsilon_0 c^2 r} \frac{dv}{dt} \quad \text{---- (10)}$$

(Eq. 10) $E = Ec + Em + Et = F/Q_2 = Q_1\underline{r}/4?e_or^3 + \underline{D}_r\, Q1/4?e_or^2\,(v/c)^2\,[1\text{-}3/2\,\cos^2?] - a_a\, Q1/4?e_oc^2r\, dv/dt$

Note that the Coulomb intensity $\underline{E}_c$ is the same in (9) and (10). The motional intensity E_m and the transformer intensity E_t differ in form but represent in each of the two equations the same identical accelerating agencies. The outstanding difference between the two equations is that with (10), one can calculate electric intensities without having to entertain any field concepts, electric or magnetic! The authors claim considerable advantages for their formulation (10) over that of (9), and show five examples, each of which involves difficulties and incorrect answers if the classical Maxwell equations are employed indiscriminately, but which find correct answers in every instance with their formulation (10) (31 ~ P. Moon & D. E. Spencer: "On Electromagnetic Induction, *J. Franklin Inst.*, vol. 260, p. 213, 1955). What they do not point out is that when the terms of (9) are applied in the same discriminating manner with respect to the operational aspects of the problems, as was (10), the ambiguities disappear and correct answers are forthcoming.

The Principle of Superposition as applied to fields, states that when several fields are superimposed on one another, each will act as though the others were absent. The simple addition of the separate terms in both (9) and (10), tacitly implies that this principle holds true in all cases. This tacit assumption in turn stems from the assumption that there is but one electric field, and each of the three terms being of this one nature, can be superimposed and added vectorially. If there was but one electric field in nature, then one would have to admit that the simple addition of these terms is scientifically correct. If, however, we have several unique electric fields in nature, each with its own unique physical properties, then the Principle of Superposition as applied to these fields is open to question. To illustrate this point, let us consider a case where we have only the two uniform E_c and E_m fields present, superimposed so as to be equal in intensity, parallel, and oppositely directed. Equations (9) and (10) then reduce to:

(Eq. 11) $\underline{E} = \underline{E}_c - \underline{E}_m = 0$

It becomes obvious at once that if there is but one electric field in nature, then the resultant field is zero. If, however, each of these fields is unique, and a physical experiment can be so arranged as to permit only one to act, while the action of the other is restricted (due to their unique properties) then, in this case, the resultant field will not be zero as required by equation (11). If then we can arrange such a unique experiment which will pit these two agencies E_c and E_m against each other equally, we will have a critical means whereby experiment alone, not assumption nor dogma, will give us a clear cut answer to the question of fields, and the application of the Principle of Superposition. It becomes obvious that nature alone can give us the answer to the questions we have raised. If in such an experiment the equation (11) is

unambiguously not zero, i.e., if one field can be made to act alone, in the presence of the other, then this experiment will prove experimentally the spatial existence of unique electric fields, one of which is unique by virtue of electromagnetic properties not possessed by the other.

In the next chapter we will describe in detail experiments which answer the questions we have raised.

Chapter 3

Experimental Confirmations by Electrostatic Shielding

In the first part of this chapter we will deal theoretically with the subject of shielding in order that the full significance of the experimental work to be described in the latter part may be transparent to the reader.

Among the properties of electric fields, there is no single one which more clearly characterizes the uniqueness of the electrostatic field, in contrast to the electromagnetically induced fields, than the singular behavior of this field with respect to shielding. In order that this phenomenon may be thoroughly understood, let us first review the electrostatic behavior and then contrast this with that of the other two electric fields. This behavior has been termed the fundamental law of electrostatics first stated by Poisson:

"The equilibrium distribution of the charges on conductors must be such that the force on any particle of electricity in the interior of a conductor, whether solid or hollow, is zero, since in a conductor electricity can move freely and the existence of a force on the particle will cause a flow of electricity. Thus, the equilibrium condition requires that all charge resides on the outside surfaces and that no charge or electric field whatsoever exist in the interior."

Physicists are well acquainted with the fact that the E_t field, present in transformer coils, caused by a varying magnetic induction with time, does not obey this law at low frequencies, and only at high frequencies and with heavy shielding can this field even approach being effectively screened out. Since Poisson's law is a fundamental law, which applies to all electrostatic fields, it becomes evident at once that the Et electric field cannot and does not qualify as being electrostatic in character. This means that the Et electric field must be unique in nature. Although most physicists are willing to admit that this field, which arises from the growth or decay of a magnetic flux with time, is not electrostatic, nevertheless they cling tenaciously to the belief that there is only one electric field in nature (32 ~ Sleplan, op. cit.). Believing that the isolated motional electric field $\underline{v} \times \underline{B}/c$ has been shown mathematically to be electrostatic in character because teachers of relativity theory have taught this, it is not difficult to stretch the imagination a little further to include the E_t field. We will, however, proceed to present direct experimental evidence which confirms the claim presented in this thesis that the isolated motional electric field is note and cannot be electrostatic in character. As we have seen, nevertheless, this field had deceptive aspects which cause it to resemble in many ways the electrostatic field.

In order that the case may be transparently understood, let us consider a very simple case of relative motion. Let us assume that we have an inertial system S which has only a uniform downward magnetostatic induction $\underline{B}$, and no electrostatic field is present. In the inertial system S', which is moving with uniform horizontal velocity $\underline{v}$ with respect to S, the transformation equations (4) and (5) yield:

(Eq. 12) $\underline{E}' = ? (\underline{v} \times \underline{B})/c$

(Eq. 13) $\underline{B}' = ? B$

$$\bar{E}' = \gamma (\bar{v} \times \bar{B})/c \quad \text{---------- (12)}$$
$$B' = \gamma B \quad \text{---------- (13)}$$

For convenience, let us think of the system S' as a completely closed rectangularly shaped coach, made of aluminum, traveling due North with velocity v. Let us think of B as the magnetic induction due to the earth's magnetic field (presumed vertical). The transformation equations (12) and (13) inform us that an observer riding in his car would find a vertical magnetostatic induction B', both inside and outside the car, which for ordinary speeds would be identical to B. This induction would be reduced to zero by building around and attached to the car a large Helmholtz coil which would produce within and throughout the car an equal but oppositely directed induction B". By doing so we isolate the electric field E' within the car. An observer would find outside the car a uniform electric field E', directed from East to West, given by (12). Within the car, however, we know from experience that an ordinary electric field intensity probe would register zero, or no resultant electric field intensity. According to most interpreters of the Special Theory of Relativity, this is exactly what should be expected, since they claim ?(v x B)/c is identical to, and indistinguishable from, an electrostatic field, and it must, therefore, behave similarly with respect to shielding. Hence, according to this view, the aluminum coach, being a good conductor, has produced within it in accordance with the fundamental law of electrostatics a surface redistribution of charge which brings about the complete cancellation of all electric field within the car so that no charge or electric field whatsoever exists inside the exterior bounding surface of the car.

An entirely logical and different conclusion may now be arrived at by reasoning based upon our known laws of electromagnetism. The car is moving across a magnetic induction B directed vertically downward. Therefore every free electron within the aluminum shield will experience a force due to the electromagnetically induced field ?(v x B)/c urging it toward the right hand side of the car. Under the influence of this field a redistribution of charge thus takes place until an electrostatic field E_s directed horizontally across the inside of the car from the West wall to the East wall, equal in intensity and oppositely directed to the inducing field is established. When equilibrium is thus established, there will be within the car two oppositely directed coterminous electric fields, of types E_c and E_m, in balance such as to produce a zero resultant electric intensity.

The question before us now is, which picture is correct? Can it be that E_s and E_m are actually identical in nature and complete cancellation within the car takes place? Experimental evidence must answer this question, and it does, clearly and decisively. Before presenting this answer, however, it will be of interest to note some of the comments made by physicists with respect to this question and the dense fog which has surrounded it. A colleague at the National Bureau of Standards, giving a view in harmony with most interpreters of relativity theory, has, in a letter, written with respect to the inside of the shield:

"If it is assumed that magnetic induction has a certain property not in conflict with anything observed experimentally, it follows that there are two electric fields which at every point are equal and opposite in direction. One of these fields results from electromagnetic induction and the other from electric charges.

"If it is assumed that magnetic induction has another property, not in conflict with anything observed experimentally, it follows that at no point is there an electric field and on no element of surface is there an electric charge. Therefore, any prediction not in accord with both of these assumptions should be considered as lacking an experimental basis.

Smythe, in commenting upon the problem of measuring ground speed in an aircraft by measuring the emf induced in a device by translation across the vertical component of the earth's magnetic field, states:

"The question arises as to whether the effect disappears if the apparatus is electrically shielded in the airplane. We know that the magnetic field will penetrate nonmagnetic metallic conductors, but we also know that the induced electromotive forces in the shields will set up electric fields tending to counteract the fields induced inside." (33 ~ William R. Smythe, *Static & Dynamic Electricity*, p. 500, McGraw-Hill, 1939)

Thus, S' finds his airplane in a transverse electric field, ($\underline{v}$ x $\underline{B}$)/c. he cannot therefore use any metallic shields about his apparatus.

Here again we have the uncertain popular view among physicists as to whether E_s and E_m are in this case identically equivalent concepts which completely cancel each other. We will now show that this does not occur.

The Ironing Board Experiment ~ (34 ~ Egbert Jones & W. J. Hooper: *Physics 401 Project*, March 26, 1954, Principia College Library)

This crucial experiment was so named because the apparatus resembled somewhat an ironing board on wheels. The object of the experiment was to detect and measure the voltage induced in a test coil by the motional electric field E_m while it was in a balanced and uncancelled state with an equal and oppositely directed electrostatic field E_c:

Figure 4: The Ironing Board Experiment

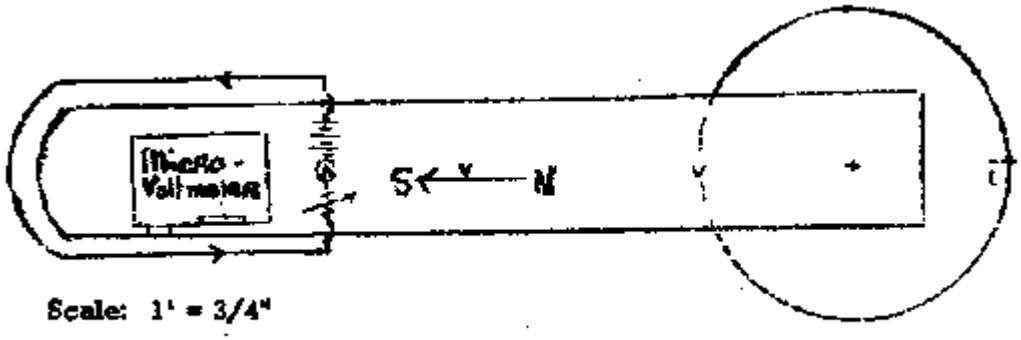


FIGURE 4

Three electrical circuits were employed, all lying in horizontal planes, parallel to a large laboratory lecture table. The test circuit consisted of a coil of 100 turns of #27 B&S gauge insulated copper wire wound in a groove on the 3/4" edge of a plywood form in the approximate shape of an ironing board 1' x 7' 4", as shown in the scale diagram Figure 4. The terminals of this coil were connected to a Leeds & Northrup Microvoltmeter which was mounted on the plywood form, which in turn was equipped with rubber-tire wheels so that it could be pulled at a uniform North-South velocity along the lecture table by an electric motor coupled to a reduction gar. The

precise velocity was calculated with the use of a meter stick and an electric timer. Surrounding the forward end of the test coil, a second circuit was wound on a plywood extension consisting of a single strand of #16 B&S copper wire held at a constant two-inch distance from the test circuit, and carried a uniform direct current so adjusted that the magnetic flux B" surrounding it would exactly cancel out the vertical component B of the earth's magnetic field at the location of the test circuit. The third circuit was a largely accurately constructed Helmholtz coil so mounted in the laboratory and adjusted that the trailing end of the test circuit moved horizontally in the central region (between the two coils) in which the vertical component of the earth's field was completely cancelled. The entire test circuit including the microvoltmeter was electrostatically shielded. A very heavy coat of aquadag was applied over the test coil and the top and bottom of the supporting plywood frame. In addition, aluminum foil was wrapped around the forward semicircular part of the test coil, and finally put over the entire front portion of the apparatus. When moved uniformly along the table, the shielded wires of the test coil along the two sides of the frame move horizontally in the earth's magnetic meridian and therefore cannot cut any flux. The trailing edge of the test coil in the central region of the Helmholtz coil likewise can cut no flux. The forward end of the test coil alone cuts the vertical component of the earth's field, and is not at rest with respect to the canceling flux B" of the secondary circuit. The shield, with the exception of the portion within the Helmholtz coil, likewise cuts the vertical component of the earth's magnetic field. We now have a perfect set-up with which to test experimentally whether or not the uniform isolated motional electric field is equivalent and identical to the electrostatic field. The walls of the shield have induced in them an emf which drives electrons to the west side and leaves a positive charge on the east side of the shield. We know that these charges will build up until the electrostatic field caused by this separation of charge will be everywhere within the shield equal and opposite to the intensity of the motional electric field giving rise to it. If they are equivalent and identical in nature, they will completely cancel each other out and the leading wires of the test coil will be in a field-free space. If a voltage is induced in the test coil, it will be because these two fields do not cancel each other, because they are unique and different in their fundamental physical natures. Table II gives the results of 19 different velocities which were carefully measured:

Table II

Trial ~ Distance (cm) ~ Time (sec) ~ Velocity (cm/sec) ~ MicroV (observed) ~ MicroV (theory)					
1	28.9	46.1	.626	10.5	10.3
2	20.0	28.2	.708	11.5	11.7
3	20.0	28.6	.699	11.5	11.5
4	20.0	31.3	.639	10.2	10.5
5	20.0	28.4	.704	11.2	11.6
6	20.0	30.1	.665	10.5	11.6
7	20.0	29.4	.680	11.0	10.9
8	20.0	29.0	.590	11.2	11.4
9	20.0	28.8	.698	11.3	11.5
10	20.0	31.1	.644	10.5	10.6

11	20.0	30.8	.651	10.5	10.7
12	20.0	30.7	.651	10.7	10.7
13	20.0	31.7	.632	10.7	10.4
14	20.0	32.1	.623	10.0	10.3
15	20.0	32.5	.615	10.2	10.2
16	20.0	32.5	.616	10.0	10.3
17	20.0	32.2	.623	10.1	10.3
18	20.0	32.0	.625	10.5	10.3
19	20.0	32.4	.618	10.0	10.2
				202.1	204.5
			Average Values:	10.64	10.76

$v = nvBl$ (volts; $n = 100$; $B = .55 \times 10^{-4}$ Webers/m^2; $l = .30$ meters

The experimental average value of induced voltage is lower than the calculated theoretical average value by only 1.11% and is well within the possible experimental error.

The argument has been advanced that this experiment proves nothing since by Faraday's law an emf is induced where there is a time rate of change in total flux linking the circuit, and this experiment involved such a time rate of change and, therefore, the results should have been expected, for it is known that shielding is not effective in transformer cases in which this law is applicable. This argument is not valid for the following reason. We have shown in Chapter 1 that the flux linking a closed circuit can be changed in only three possible ways: (1) flux cutting, (2) the growth and death of flux as in transformer phenomena, (3) special switching arrangements. Items (2) and (3) were obviously not involved in this experiment. Therefore there can be no appeal to transformer phenomena. The flux density B is constant throughout the experiment and therefore Maxwell's equation Curl E = ?B/?t, which is his interpretation of Faraday's Law, cannot be invoked. The experiment is so designed that the only possible seat of induced emf would have to be in the aluminum shielded leading wires of the test coil. The motional electric field alone is involved.

A brief account of two other shielding experiments carried out in the writer's laboratory to provide interesting qualitative demonstration equipment will now be described.

The Trapeze Experiment

The trapeze bar was made of six one-meter length pieces of soft iron pipe telescoped within the other. A single strand of insulated and electrostatically shielded wire was threaded through the innermost pipe of the bar and fastened at two places in the ceiling of the laboratory in such a manner as to permit the trapeze to swing horizontally in a North-South direction while the supporting wires on each side moved in the magnetic meridian and therefore could cut no magnetic flux. The shielded wire was connected to a sensitive wall galvanometer which was also shielded. Here again we have only the isolated motional electric field involved, for it is well known that the iron pipe would completely screen out the earth's magnetic field from the interior. With this simple apparatus, it ca be readily demonstrated that any small horizontal movement of the bar causes a deflection of the galvanometer directly proportional to its velocity. No measurable magnetic flux exists within the innermost pipe, but the electric field $\underline{V} \times \underline{B}$ is present

without diminution, and uncancelled by the equal and oppositely directed electrostatic field set up by the separation of charge in the shield. The wire in the pipe cut the vertical component of the earth's magnetic field, but was at rest with respect to the bar. The deflections of the wall galvanometer for a given speed were identical with or without the iron pipe and electrostatic shielding around the wire in the trapeze bar.

The Aluminum Box Experiment

In this experiment the entire apparatus was contained in a closed aluminum box which was moved horizontally in a North-South direction on a laboratory table. The test coil was rectangular in shape, made up of many turns of fine, flexible, insulated copper wire. The North and South sides of the rectangular coil were rigidized and supported in the same horizontal plane within the box. The South side was fastened to the inside South wall of the aluminum box and the terminals of the coil were connected to a sensitive portable galvanometer also mounted on this wall so that the pointer could be read through an opening in the box. The North side of the coil was supported in a fixed position by two plastic rods which were clamped to fixed vertical support rods on the table, and extended horizontally through holes in the aluminum box. The flexible East and West sides of the test coil hung in the magnetic meridian of the earth's field. Any movement North or South of the box thus caused these wires to either sag or become taut respectively. The presence of the uncancelled motional electric field can be demonstrated to be existent in the test coil when the box is completely closed and moved with various speed, North or South, across the earth's vertical magnetic field component. The deflections of the galvanometer with various speeds of the box are identical with those obtained when the shielded box is eliminated from the experiment and just the south side of the coils and the galvanometer were moved as before.

Summary

Let us make a brief summary of what we have thus far presented with respect to the motional electric field. Mathematical, operational, theoretical and experimental evidence convincingly confirm the concept of the motional electric field as physically real and distinctly unique. Its magnitude varies with reference frames in a manner unlike the electrostatic field. The crux of the theoretical argument involving this field amounted to the fact that the direct transfer of kinetic energy from a prime mover to a charged particle can be logically traced in detail and in accordance with known laws, and fully accounts for all energy transfer, whereas the conception of motional electric field energy existing at all and being distributed spatially, in addition to being capable of transfer, is next to impossible. The crucial evidence of uniqueness is experimental and it has been shown that this field does not obey Poisson's Fundamental Law of Electrostatics with respect to shielding. If the magnetic field has no physical reality, then when the motional electric field was balanced against an equal and opposite electrostatic field, the magnitude of the two terms in Equation (5) of the "New Electrodynamics" would have been identically equal and opposite and their algebraic sum equal to zero. The foregoing experimental evidence requires a concept of something real to account for the real difference experimentally measured. The magnetic field and the motional electric field concepts constitute that "something of fundamental physical significance" which was intentionally but ill-advisedly omitted in the new formulation in terms of particle electrodynamics.

Upon the foregoing evidence we rest our case that this motional field is unequivocally a unique electric field possessing its own nature, behavior and properties. We have asked nature a question and the reply is clear and unequivocal. Quantitative and qualitative experimental evidence such as has been carefully obtained in this case always has the last word. It closes the

door on controversy and opens it wide toward the dawn of new horizons. Nature herself has given the answer which, in the words of Enrico Fermi, should "indeed be of great significance and consequence" to our scientific knowledge. The implications and consequences of this discovery will be discussed more fully later. They do, however, lead us immediately to the necessity for making inquiry into the basic nature of the analogous motional $\underline{V}$ x $\underline{E}$/c magnetic field. This we will do in the next chapter.

Chapter 4

The Motional Magnetic Field

The classical belief that nature has provide us with one and only one magnetic field has so befuddled reason that physicists have sought to eliminate the magnetic field concept entirely. To illustrate the ambiguity, the magnetic field arising from two operationally different sources will be described. The impossibility of these two fields beings identically the same becomes apparent upon comparison:

(1) The magnetic flux arising from the steady flow of electricity in a solenoid can be measured in intensity and in spatial energy content at any point in the surrounding space by an observer, either at rest or in motion with respect to the solenoid.

(2) The second source can best be described by a quotation from Sir Arthur Eddington:

"Consider an electrically charged body at rest on the earth. Since it is at rest, it gives an electric field, but no magnetic field. But for the nebular physicist it is a charged body moving at 1000 miles a second. A moving charge constitutes an electric current which in accordance with the laws of electrodynamics gives rise to a magnetic field. How can the same body both give and not give rise to a magnetic field? On the classical theory we would have to explain one of these results as an illusion. On the relativity theory, both results are accepted, magnetic fields are relative." (35 ~ A.S. Eddington: *The Nature of the Physical World*, p. 22, Macmillan Co., 1929)

The magnetic field arising from the solenoid is obviously born by the cooperative relative motion between unlike electric charges, such as the flow of negative electrons past the positively charged atoms in a copper wire. This type of magnetostatic field intensity is given the symbol $\underline{H}_s$ and is identified in Maxwell's equations by Curl $\underline{H}_s = \underline{J}$ where $\underline{J}$ is the current density. $\underline{B}$ = mu $\underline{H}_s$. Mu is the permeability (mks units).

$\bar{B} = \mu_s \bar{H}_s$. μ_s is the permeability.

The second type identify by the symbol $\underline{H}_m$ and arises wholly from relative motion v with respect to electric charges. This intensity $\underline{H}_m = \underline{V}$ x $\underline{D}_c = E\underline{V}$ x $\underline{E}_c$ (mks units) where E [Epsilon] is the permitivity, and $\underline{D}_c = E\underline{E}_c$.

That the two magnetic fields $\underline{H}_s$ and $\underline{H}_m$ cannot possibly be identical in nature is proved mathematically as in the case of the $\underline{E}_c$ and the $\underline{E}_m$ electric fields. The general mathematical expression for these two fields are obtained from the Einstein transformation equation (5) in free space where B = H in absolute gaussian (cgs) units as follows:

(Eq. 14) $\underline{H}'_s = \underline{B}'_s = ?\underline{H}_s$

and

(Eq. 15) $\underline{H}'_m = \underline{B}'_m = ?\underline{V}$ x $\underline{E}_c$

where ? = 1/?*l* - $(v/c)^2$ and c = 3 x 10^{10} cm/sec.

$$\bar{H}'_s = \bar{B}'_s = \gamma \bar{H}_s \quad \text{---------- (14)}$$

and

$$\bar{H}'_m = \bar{B}'_m = \gamma \bar{V} \times \bar{E}_c \quad \text{---------- (15)}$$

where $\gamma = 1/\sqrt{1-(v/c)^2}$ and $c = 3 \times 10^{10}$ cm/sec

Inspection shows that if the two magnetic fields $\underline{H}'_s = ?\underline{H}_s$ and $\underline{H}'_m = ?\underline{V} \times \underline{E}_c$ were parallel and balanced against each other, for constant values of $\underline{E}_s$ and $\underline{E}_c$, there is one and only one possible value of v for which these two fields would have the same numerical value. In other words, if they were balanced against each other in one reference frame, they would immediately be out of balance and could not possibly cancel each other in any other frame of reference. Hence they cannot possibly be the same kinds of magnetic field, because they behave differently with change in reference frames.

Because $\underline{H}_m = \underline{V} \times \underline{E}_c$ is a magnetic vector directed at right angles both to $\underline{V}$ and $\underline{E}_c$, the electric field $\underline{E}_c$ can do no work, since any displacement of a magnetic particle will be a deflection at right angles to this field. The $\underline{H}_s$ magnetic field, however, can impart energy directly to a magnetic particle from its field energy.

The two types of magnetic fields described above have such obvious dissimilarities that the only possibility of a consistent satisfying picture of them is obtained by the application of Bridgman's Operational Viewpoint. When this is done we see these fields as unique. The first type $\underline{H}_s$ is analogous to the Coulomb electrical field $\underline{E}_c$ in that it has physical reality, and has a spatial distribution of magnetic energy $?H^2/8?$ ergs/cm^3 . The motional magnetic field $\underline{H}_m$ is analogous to the $\underline{E}_m$ field in that it too disappears when there is no relative velocity.

The intimate relationship and unity between electricity and magnetism is seen in these two fields. The motional electric field can be described as a magnetic deflection phenomenon produced on moving charges, and the motional magnetic field can be viewed as an electric field deflection which will act on moving magnetic poles.

One of the thrills of this research project was predicted by Bridgman when he wrote, "In this self-conscious search for phenomena which increase the number of operationally independent concepts, we may expect to find a powerful systematic method directing the discovery of new and essentially important physical facts." (36 ~ ibid., p.224)

It is worth our while to note that we have six such unique field concepts shown on page 11 instead of the classical two, or the modern particle dynamics with none! These new field concepts when understood in connection with the equations of modern electrodynamics completely eliminate the paradoxes and ambiguities which have plagued this subject for years and explain electromagnetic induction which particle electrodynamics cannot handle. Most of all, they open up new horizons for the unification of the three great fields of electricity, magnetism and gravitation

Chapter 5
Gravitation

"In the limited nature of the mathematically existent simple fields and the simple equations possible between them, lies the theorists' hope of grasping the real in all its depths." (37 ~ Albert Einstein: *Essays in Science*, p. 110; Philosophical Library, NY, 1934)

"It may well be that the approach of a new theory cannot begin until the mathematical nature of the old ones is clearly understood." (38 ~ Freeman J. Dyson: *Scientific American*, September 1958)

In the previous chapter we have shown how Bridgman's Operational Viewpoint applied to our "existent simple fields and the simple equations possible between them" has enabled us to gain an understanding of "the mathematical nature of the old" classical equations of electrodynamics which were beset with limitations, ambiguities, and paradoxes.

In order to obtain correct answers to our problems, it has been taught us that they must be analyzed operationally (40 ~ This becomes self-evident to anyone who will review the publications already cited, referring to Cohn, and to Moon and Spencer) to determine the particular types of fields that are involved, and the particular formulae among the six field types available must be selected and employed for the solution. The properties of each field type must be taken into consideration in working out problems. This clarified, straightforward procedure, working with unique field types, affords present possibilities that were not available to Einstein, due to mental doors which were closed.

It was without question Professor Einstein's life ambition to find the link between the gravitational field and the phenomena of electricity and magnetism. The reason for his failure appears now to be transparent in the light of this thesis. Most interpreters of his special theory, including Einstein himself, recognize the existence of but one electric field, in spite of the fact that Sir James Jeans has pointed out that such an interpretation of the terms in the transformation equation of his theory is not required by the postulates of the theory itself. (41 ~ J. H. Jeans: *The Mathematical Theory of Electricity & Magnetism*, p. 606, Cambridge Univ. Press, 1923)

In the English translation of his volume, *Mein Weltbild*, Einstein makes several very pertinent remarks which bear upon this thesis:

"It would of course be a great step forward if we succeeded in combining the gravitational field and the electromagnetic field into a single structure. Only so could the era in theoretical physics inaugurated by Faraday and Clerk Maxwell be brought to a satisfactory close." (42 ~ Albert Einstein: *Essays in Science*, p. 19; Philosophical Library, NY, 1934)

In this chapter we deal with one of the "simple fields" which has been known for years and universally employed in the generators of our electrical power plants, the unique nature of which has been unrecognized and its usefulness only partly exploited.

The greatest hurdle to be overcome in attempting to link gravitational force with any of the other known field forces of nature, is that property of gravity which enables it to act without apparent diminution in and throughout all kinds and combinations of matter. Insofar as we are aware there is no kind of matter which acts as an effective reflector or absorber of this force.

Let us now review the results of the experiments described in Chapter 3, the Ironing Board Experiment, the Trapeze Experiment, and the Aluminum Box Experiment. In all of these experiments the motional $\underline{V} \times \underline{B}$ suffered no diminution by virtue of the kinds of electrostatic shielding employed (i.e., iron, aluminum, brass, aquadag). We knew with certainty where the

seat of action of the induced motional electric field was localized in these experiments. The behavior of this field in these experiments, therefore, has aspects which are exactly similar to gravity. Even when the resultant B itself is reduced to zero, VxB exists unaltered! No other force exists, to our knowledge, with such an unalterable and penetrating nature except that of gravity!

With the experimental evidence of the fact that the V x B field can in no instance be shielded from a region of space by a conducting shell and that it does not possess the properties of an electrostatic field, as has been tacitly assumed by theoretical physicists without experimental evidence to support it, we are brought face to face with the fact that this V x B field is really something entirely different than it has been hitherto thought to be, in spite of the fact that it is the generating field so active in our electrical power plants. Indeed it will be shown that this field should behave in a manner that is identical to gravity.

Let us remember that this VxB field is an electric field, that is, it will exert a force on, and will cause the acceleration of electric charges. In this respect it is similar to an electrostatic field. But an electrically neutral conductor places in a VxB field is acted upon differently than when it is places in an electrostatic field. In the latter field only an outside surface redistribution of charge and field take place whereas in a VxB field the neutral conductor experiences an internal redistribution of charge throughout its entire interior with two types of electric fields existent within the interior, balanced against each other in the equilibrium state. This state of affairs has been experimentally verified in the writer's laboratory and this evidence is the crucial blow which overthrows the popular view that the VxB field is electrostatic in nature. In the electrostatic case the field is entirely on the outside of the conductor, whereas in the VxB case, this field exists both within and without the conductor.

Within a conducting enclosure which is placed in an electrostatic field, this field is well known to be self-cancelled, whereas when placed in a motional electric field, this field gives rise to what has been thought to be a canceling electrostatic field equal in magnitude and oppositely directed, but contrary to popular belief this motional electric field is uncancelled by this induced electrostatic field and remains undiminished in intensity and in balance with it. This immunity to cancellation by shielding is the property which it has in common with gravity.

It is the penetrating property of the B x V field which qualifies it to play the role of a gravitational field (43 ~ The term B x V is use when one refers to a source which causes a magnetic flux B to move with a velocity V as would be the case when the field originates in atoms of matter. Mathematically, V x B = -B x V). This field can reach to every part of atomic structure and in and throughout the nucleus. Magnetic shielding cannot prevent it because B x V exists, regardless of the presence of a resultant B, which may or may not be zero. It seems incredible that this penetrating nature was discovered even in the days of Faraday and yet so little attention has been given to it.

In describing the work of Faraday on electromagnetic induction, Maxwell stated that the intensity of the induced electric field "is entirely independent of the nature of the substance of the conductor in which it acts" (44 ~ Clerk Maxwell: *Electricity & Magnetism*, vol. 11, p. 181). This was also later found to be true for dielectric substances as well as conductors.

Matter, as we know it, consists of electrons, protons and neutrons. The actual nature of the neutron is not known with certainty. This we do know, that a neutron does emit a beta particle, an electron. We also know that a proton can by electron capture turn into a neutron. While the present tendency is against the belief that the neutron consists of a proton and an electron in close bond, this thesis assumes that it does have an internal structure composed of opposite electrical charges. We so know that it has a magnetic moment. If magnetism is due to charges in

motion, then we cannot be far wrong in this assumption. Electrons and protons also have magnetic moments. In other words, each of the elementary particles which make up ordinary matter has associated with it a magnetic moment, electric charge, or charges. In the experiments of Stern and Gerlach, magnetic moments were measured by causing a beam of particles to pass through a wedge-shaped magnetic field which deflected them.

Let us consider a solid cylindrical bar magnet of circular cross section rapidly rotated about its longitudinal axis. While it is well known that in this case the magnetic field does not rotate with the magnet, let us assume for convenience that it does rotate with the magnet. If the axis of this magnet is vertical with the North pole uppermost, then in the equatorial plane midway between the poles of the magnet we will have a magnetic field everywhere directed vertically downward, and the motion of this field will be toward the observer on one side and away from the observer on the other side of the magnet. In this equatorial plane there will also be a radial horizontal BxV electric field. This field will be convergent or divergent depending on the direction of rotation of the magnet.

Let us consider what would happen if an atom of any kind of matter is placed in a convergent or divergent BxV electric field. The planetary electrons will all experience a force which will shift their orbits slightly, say away from the axis, whereas the nucleus would be pulled toward it. There will be a very small differential in the magnitude of these two forces due to the slight shift in the position of the center of mass of the electrons with respect to the position of the nucleus. In this case, the push on the electrons will be less than the pull on the nucleus. The net effect of this will be a small attractive force which will tend to move the atom toward the axis of the magnet. Even a single neutron placed in a convergent BxV electric field might experience this attractive force if its constituents are oppositely charged attractive particles. Such a field might be employed to investigate the composition of the neutron! The crux of this paper is that it proposes that gravitational force is none other than the difference between the pull and the push of a convergent or divergent BxV electric field acting on the electrical constituents of atoms.

The consequences of this proposal would mean that the phenomenon of mass is independent of weight. An electron alone in such a field might be repelled while a proton would be attracted. This is a staggering thought, but we know of a certainty that an electron or a proton by itself actually has weight? Might not the negative charge which the earth is known to possess be due to a radical convergent BxV field emanating from the atoms composing the earth? If all neutral matter consists of equal numbers of oppositely charged electrical particles then the total mass of a body would be proportional to the total charge of one sign contained within it. It is here proposed that the earth's gravitational field might well be a convergent BxV field. We know that such a radial field is uniquely qualified to penetrate all space occupied by matter and produce a differential attractive force toward the earth's center of gravity by separating elementary charges of opposite sign only a trifle from their normal mean positions and thus making the pulling force on the positive charges slightly greater than the pushing force on the negative charges.

Each of the elementary particles of which all matter is composed is also an elementary magnet. The atom of today is a dynamic model. Each of these magnets has motion of some kind --- orbital, vibrational, precessional. In addition to possessing a magnetic moment due to spin, planetary electrons orbiting nuclei generate magnetic fields. These motions of the elementary magnets produce BxV fields which extend into space outside the atom. Nowhere in modern theory is an account given of these super-imposed BxV fields emanating from all matter. On might think that in ordinary nonmagnetic matter they would all cancel out since this is what happens with the magnetic fields in such matter. The electrons are paired in the various energy shells (of most atoms) in such a way as to effect this cancellation of magnetic fields outside the

atom. Theory shows that if two such paired planetary electrons revolve in opposite directions, one clockwise and the other counter-clockwise, their magnetic fields due to spin at a point outside the atom can cancel each other out and that their $\underline{B}x\underline{V}$ fields can constructively reinforce each other. The capital theoretical discovery, however, comes from a study of the magnetic field generated by the orbital motion of the planetary electrons. The negative electron, revolving about a positive nucleus, clockwise or counter-clockwise, gives rise to a $\underline{B}x\underline{V}$ field which is, in either case, always directed radially inward toward the nucleus from points outside of atoms. The magnetic fields of two such oppositely revolving electrons will cancel, but the $\underline{B}x\underline{V}$ fields reinforce each other. That these fields are directed radially inward makes it possible for them to account for the known drift of positive ions in the atmosphere down toward the earth and the opposite movement of negative ions upward. Because of its promising potentialities let us now take up an analysis of the magnetic field and motional electric field arising from orbiting planetary electrons.

Let us take for our model the simplest possible example, the Bohr Hydrogen Atom. Consider the nuclear proton at rest and the negative electron as revolving in a circular orbit of radius r_o about it with angular velocity *v*. The Ampere-Biot-Savart expression for the magnetic field B generated about a charge *q* moving with velocity *v* is in mks units:

(Eq. 16) $\underline{B} = q\,\underline{v} \times \underline{r}/r3$

where $\underline{r}$ is the radius vector from q to a point P where $\underline{B}$ is measured. If the electronic charge -q is moving through free space without association with neighboring charges then we know that $\underline{B}$ appears as a motional magnetic field due to relative velocity of the electric field of the charge with respect to the observer at P. In this case, if the observer moves with the same velocity v as the charge, then the magnetic field at P disappears. On the other hand, if -q is moving in a linear conductor with relative velocity v, then an observer at the point P will observe a magnetic energy field $\underline{B}$, whether or not he is stationary or moving. The actual value of $\underline{B}$ will of course be altered if the observer takes on relativistic velocities. But $\underline{B}$ will be observed in any frame of reference moving through, or stationary at, the point P. We now inquire with regard to the status of $\underline{B}$ at a point P when the planetary electron is revolving about the proton in a Bohr atom. Since we know this field is generated by cooperative action with the positive nucleus and that planetary electrons in magnets contribute components of orbital magnetic moment, we know that $\underline{B}$ must be an energy type magnetic field. The Ampere-Biot-Savant formula requires that at any instant the maximum values of B will be found at points along a rotating radius vector drawn from the proton through -q to the point. This means that the magnetic field energy of B is moving in a concentric orbit with the electron, with a tangential velocity $V = (r_o + r)w$ at any point a distance r from -q. If the magnetic field which the electron carries about it as it revolves in its orbit were of the motional magnetic field type $\underline{E}_s \times \underline{V}$ generated solely by the relative motion of a single electric charge and an observer, then one could hardly impute motion to it. However, in this case we know the magnetic energy is itself a physical reality by virtue of its known type. This toroidal-like band of energy obviously holds a fixed relative position with respect to the orbiting electron, and hence moves with it.

This moving magnetic field, we know, will in turn give rise to a motional electric field $\underline{B} \times \underline{V}$. This is illustrated in the accompanying Figure 5.

Figure 5

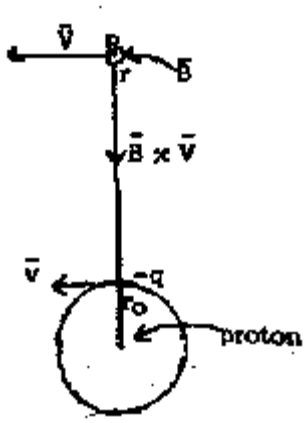


FIGURE 5

When the electron has a counter-clockwise motion in its orbit, it will give rise to a B at point P which will be directed up out of the page. V will have the same direction as v, and B x V will be directed radially inward toward the proton. We will call this a convergent motional electric field. Let us now calculate the value of this field at any point P on the radius vector from the nucleus through -q when the electron is the upper part of its orbit.

$\underline{E}_m = \underline{B} \times \underline{V} = -q(\underline{v} \times \underline{r}) \times \underline{V}/r^3$

And when $r >> r_o$, $v = rw$ and $v = r_o w$

(Eq. 17) $E_m = -qr_o w^2/r$ approximately

We note that as the electron swings through the upper half of its orbit a motional electric pulse directed toward the nuclear proton with a maximum intensity varying inversely as the distance from the electron should be present at point P. As it continues to swing through the lower part of its orbit it is at this time not clear just what effect will be present at P. Our knowledge of the structure of the fundamental particles is so small that we cannot say whether or not the electric field about the proton itself will rotate about it as the electron revolves in its orbit. The electron is the particle in motion and there appears to be good reason to believe that the magnetic flux generated around it will be confined, on one side mostly between the electron and the proton, and on the other side of the electron out into space with its maximum intensity lying in the electron's equatorial plane at right angles to its orbital velocity. This is clearly not the equivalent of the effect due to a continuous current flowing in a conducting circular loop. In this latter case one would have a magnetic dipole at any instant in time, whereas in the case of a single electron we are dealing at each instant in time with circular loops of flux, without poles, with the electron located eccentrically within the circles.

Let us digress at this point and consider another phenomenon to which we should give some attention. An electron has spin, and is itself a small magnetic flux emanating from it. Out experimental knowledge regarding the behavior of magnetic fields with respect to rotation about axes of magnetic symmetry is such that we can state with considerable certainty that the magnetic field of the spinning electron should undergo a motion of translation only, as its axis revolves in the electron orbit. This means that at the point P in Figure 6, the magnetic flux due to the electron will partake simultaneously of two superimposed linear simple harmonic motions, one toward and away from the atomic nucleus and the other at right angles to this direction. As the magnetic flux moves across the point with these two motions, two component motional electric fields will be induced there. The motion of flux toward and away from the proton will

induce an alternating electric field which will always be at right angles to the line d. The motion of flux at right angles to this line will likewise induce an alternating electric field which will always be directed along this line but will have a greater intensity in one direction than the other. The vector resultant of the motional electric field E at the point P will be a variable vector, rotating counter-clockwise with angular velocity v and it will trace out a pear-shaped figure with the major axis directed along the line d. The point P is near the top of the figure farthest removed from the atom.

Figure 6

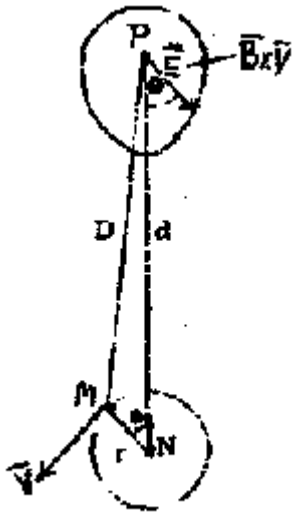


FIGURE 6

$\underline{E} = \underline{B} \times \underline{V}$
$W = d^w/dt$ = angular velocity of B x V field in volts/m.
$\underline{E}$ = Electric intensity of $\underline{B} \times \underline{V}$ field in volts/m.
$B = M/D^3$ Magnetic flux density due to M (in W/m^2) at P. It is directed down into the paper.
N = Proton nucleus.
M = Electron magnetic moment directed up out of the paper.
V = rw = Tangential velocity in m/sec.

It can be readily shown that the motional electric field intensity at P will be given by:

(Eq. 18) $\underline{E} = \underline{B} \times \underline{V} = BVm = M/D^3\ rwm$

where $\underline{m}$ is a unit vector parallel to $\underline{r}$ but oppositely directed.

Since $D = ? r^2 \sin^2 ? + (d - r \cos ?)^2$

$E = vMm / [r^2 \sin^2 ? + (d-r \cos ?)^2]3/2$

Since $\sin^2 ? + \cos^2 ? = 1$

$E = Mrwm / [r^2 d^2 - 2\ rd \cos ?]3/2$

And when ? = 0? $E = Mrw/(d-r)^3$ toward the atom,

When ? = 180? $E = Mrw/ (d-r)^3$

And when ? = 90? or 270?

$E = Mrw/(d^2 + r^2)3/2$

$\bar{E} = \bar{B} \times \bar{V} = BV\hat{m} = \frac{M}{D^3} rw\hat{m}$ where $\hat{m}$ is a unit vector parallel to $\bar{r}$ but oppositely directed.

Since $D = \sqrt{r^2 \sin^2\theta + (d - r\cos\theta)^2}$

$$\bar{E} = \frac{Mrw\hat{m}}{\left[r^2\sin^2\theta + (d - r\cos\theta)^2\right]^{3/2}}$$

Since $\sin^2\theta + \cos^2\theta = 1$

$$\bar{E} = \frac{Mrw\hat{m}}{\left[r^2 + d^2 - 2rd\cos\theta\right]^{3/2}}$$

and when $\theta = 0°$ $E = \frac{Mrw}{(d-r)^3}$ toward the atom.

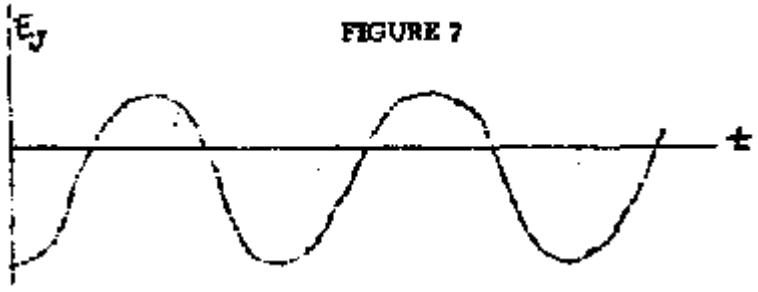
when $\theta = 180°$ $E = \frac{Mrw}{(d+r)^3}$ away from the atom

and when $\theta = 90°$ or $270°$

$$E = \frac{Mrw}{(d^2 + r^2)^{3/2}}$$

Graphed as a function of time, E_y along d would appear somewhat as shown below:

Figure 7



Whereas Ex would resemble a sine curve with equal positive and negative amplitudes.

Our analysis thus far has led us to two quite dissimilar motional electric field which should be found emanating from all matter. The first one we found arises from the rotary movement of the magnetic flux which forms around the planetary electrons in their orbital travel. The second arose by virtue of the translational motion of the magnetic flux of the spinning electrons as they revolve in their orbits. The first effect generates a radial electric intensity which varies inversely as the distance from the planetary electron. The second effect varies inversely as the cube of the distance. We shall now show that the first effect could very well be the agency giving rise to gravitational attraction, whereas the second effect would produce a very short range attractive field varying inversely as the fourth power of the distance, which obviously disqualifies it for the role of gravity, although it may prove to have some utility otherwise, as we shall see.

As stated earlier in this text, any material object placed in a convergent motional electric field should experience a force tending to move it into a more intense region of the field. When placed in the field, the body becomes electrically polarized and a very small separation of charge distribution should take place in every atom of the body. The charge nearest to the more intense region of the field will experience a pull which will be slightly greater than the push on the charge which is more remote, hence the resultant attractive force. Let us calculate this force in the case of the motional electric field generated by the electron as it orbits around the nucleus of an atom.

Returning to Figure 5, let us imagine that another hydrogen atom is placed at point P. Every time the electron swings around in its orbit at a frequency of 6.8×10^{15} rev/sec, the atom at P finds itself momentarily enveloped in a convergent $\underline{B} \times \underline{V}$ field. The positive nucleus will experience a pull toward the attracting atom while the electron will experience a push away from it. The field E_m at the point P is given by equation (17). A charge Q placed in an electric field E_m experiences a force $\underline{F}$ given by:

$\underline{F} = Q\underline{E}_m$

Differentiating this equation with respect to r in order to obtain the difference between the pull and the push, we have:

$dF/dr = Q\,(dE_m/dr)$

Hence, if the difference dF causes a small separation dr of change in the mean distance between the proton and electron in the attracted atom, we have:

$dF = Q(dE_m/dr)dr$

Differentiating (17) with respect to r, to obtain dE_m/dr and inserting this in (19) and solving for ? F, which is the difference between the pull and the push, we have:

(Eq. 20) $?F = Qqr_o w^2\ ?F/r^2$

$\Delta F = Qqr_o w^2 \Delta r / r^2$

It is important to understand just what equation (20) represents. The motional electric field intensity E_m given by equation (17) represents a radially convergent field. The intensity of the field decreases inversely as the distance *r*. When an H atom is placed in this field the positive proton is attracted toward the source of the field while the electron is repelled. If a separation of the center of charges takes place (polarization), i.e., if the proton moves slightly toward the source and the center of the deformed, somewhat elliptical, electron orbit shifts slightly away from the proton, so that these two centers are separated by a distance delta *r*, equation (20) expresses how much greater the pull on the proton will be than the effective push on the electron in its new orbit. This we call the gravitational force since it is an attractive force which pulls the H atom toward the source if it is free to move. We assume that it is not completely free to move but is restrained by elastic forces, somewhat equivalent to that of a spring. When the attracted atomic system is moved a distance delta *r'* by delta F, work is done. If we assume that delta *r'* is directly proportional to delta *r*, we then have for the work:

(Eq. 21) $?W = ?F\ ?\ ?r' = L\text{-}Qqr_o w^2\ ?r^2/r^2$

$\Delta W = \Delta F \cdot \Delta r' = kQqr_o w^2\ \Delta r^2/r^2$

Since there are approximately 10^{15} simultaneous pulls and pushes delta P each second which as a function of time would be approximately sinusoidal it should give rise to a high frequency vibratory motion which should be approximately simple harmonic in character. The polarization displacement delta *r* produced by the field E_m should be directly proportional to its intensity. Let us assume that upon release from the pull of a single pulse the H atom would be pulled back to its original position with an elastic force negatively proportional to the displacement delta *r*'. We have therefore laid the foundation for a simple harmonic vibratory motion of the atom:

(Eq. 22) $- ?r' = l ?r = Fqr_o w^2/r$

and

(Eq. 23) $?r^2 = k' q^2 r_o^2 w^4/r^2$

$$-\Delta r' = k\Delta r = Eqr_o w^2/r \quad \text{.....(22)}$$

$$\Delta r^2 = K' q^2 r_o^2 w^4/ r^2 \quad \text{.....(23)}$$

where the k values are all constants. Equation (23) in (21) gives:

(Eq. 24) delta $W = K'' Qq^3 r_o^3 w^6/r^4$

$$\Delta W = K'' Qq^3 r_o^3 w^6/ r^4 \quad \text{.....(24)}$$

and since Q = q in the H atom:

(Eq. 25) delta $W = K'' Q^4 r_o^3 w^6/ r^4$

$$\Delta W = K'' Q^4 r_o^3 w^6/ r^4 \quad \text{.....(25)}$$

For this type of motion we know that the maximum amplitude would be proportional to the square root of the total energy (25). If the maximum amplitude is proportional to the maximum value of ?F then we have:

(Eq. 26) $?Fm = K'' Q^2 r_o K v^3/r^2$

$$\Delta F_m = K'' Q^2 r_o^2 w^3/ r^2 \quad \text{.....(26)}$$

Since the phenomenon is sinusoidal, its effective value would be delta 7_o = delta 7_o/sq. root 2 $\Delta 7_o = \Delta 7_m / \sqrt{2}$. If we now let $Q^2 = k_o M_1 N_2$, the product of the two atomic masses, and $G = K'''k_o r_o w^3$/ sq. rt. 2, we have upon replacing delta f_e by simply P:

(Eq. 27) $F = G M_1 N_2/r^2$

$$F = G M_1 M_2/ r^2$$

which is Newton's Universal Law of Gravitation.

The foregoing derivation is obviously a very elementary and non-rigorous attempt by the author to indicate how two hydrogen atoms could conceivably attract each other by means of their motional electric fields giving rise to Newton's Universal Law of Gravity. We teach that two such atoms do attract each other according to this law. It seems reasonable therefore to expect that such a derivation as is here suggested cannot be too far from representing the electromagnetic basis behind the phenomenon.

A motional electric field is an electric field because it acts with force on electric charges. The essential ingredients of this field consist of a magnetic field, a charge of electricity and relative motion between them. It is preeminently an electromagnetic field. We have theoretically seen just how this field could very well be the vital agency which produces the attractive force we call gravity. We have also presented experimental evidence that this field possesses in common with gravity its chief property of being immune to shielding. Whether or not this field will ultimately be identified with gravity remains to be shown experimentally. We have made a closely reasoned approach to what may ultimately prove to be the missing link in a unified theory between the three great forces of nature, electricity and magnetism on the one hand and gravity on the other.

We have shown theoretically that two electromagnetic fields should emanate from all atoms, the intensity of one varying inversely with the distance and the other inversely as the cube of the distance. While these fields radiate or extend into space surrounding material atoms, there is no experimental evidence extent that these fields transmit energy by means of quanta or ions. These fields, therefore, cannot properly be defined as radiant energy any more than one can think of the motional electric field in an alternating current generator as a form of radiant energy. The modus operandi of these two fields is one of electromagnetic induction even as it is in our electric generators and motors. Persuasive and excellent reasons exist to predict that these two fields, emanating from the earth, might prove to be the source of free electric power, in a measure exceeding our present comprehension. A properly designed ultra-high frequency receiving circuit incorporating a transistor valve should by electromagnetic energy of induction not only detect but transform and convert to usable form the kinetic energy of planetary electrons in the atoms comprising the earth. This would be atomic energy in its most usable and nonpoisonous form. Through the medium of the motional electric field emanating from atoms, both gravitational dominion and free electrical power would seem to be within the possible grasp of our age.

High-sounding and speculative as the previous paragraph may sound, we have considerable evidence in support of it. In 1933 at the age of 77, Nikola Tesla predicted essentially what has just been stated:

"Ere many generations pass, our machinery will be driven by power obtainable at any point in the universe. Is this energy static or kinetic? If static, our hopes are in vain; if kinetic, and we know this for certain, then it is a mere question of time when man will succeed in attaching his machinery to the very Wheel-Work of nature."

At this point in our thesis, a recent statement by a contemporary scientist seems most timely and fitting:

"When the great innovation appears, it will almost certainly be in a muddled, incomplete, and confusing form. To the discoverer himself, it will be only half-understood; to everybody else, it will be a mystery. For any speculation which does not at first glance look crazy, there is no hope." (45 ~ Freeman Dyson: *Scientific American*, September 1958).

For many years the writer has known of the somewhat obscure research activities of Mr. T. Henry Moray. His claims, which appear to have been well documented, of having invented a device which would capture cosmic radiant energy continuously, to the extent of 50 kw, sounded almost crazy upon first reading. His research work on this device extends back into the period around 1926. An account of his work has been written up in several pamphlets (46 ~ T. H. Moray: *The Sea of Energy in which the Earth Floats*; see also: "A Revolutionary Invention", published by himself, SLC, UT). The work of Mr. Moray is of vital interest to this thesis, especially in view of the comments made by Dr. Carl Eyring (in 1925, then head of the

Department of Physics of Brigham Young University) who, after examining and studying the device in operation, could come to no other conclusion but that the electrical energy was obtained (at least in part) from field energy generated "in the earth itself" (47 ~ *ibid.*, p. 144-145). While not then understood, this conclusion of Dr. Eyring made so many years ago is now of capital interest.

Not understanding the nature of the source and form of the energy his device absorbed, and his consequent inability to explain in understandable its operation in patent applications, and his fear of losing patent rights and a fortune, have cost this man much disappointment and frustration resulting in virtually isolating him and his device from contact with those who could have been of great help. It would appear on the surface of things that Moray may well have tapped, without knowing it, either one or both of the energy sources which have been described and mathematically predicted as originating from the atoms composing the earth.

Chapter 6

Anti-Gravity & Electrical Power

The thrilling thing about this research project is the potential possibilities it presents, for overcoming that which keeps us down, and for providing us with free electrical power! These two possibilities, levitation and electric power appear to be practical when the experimental and engineering work of making an electronic generator of, and a receiver for, the ultra-high frequency direct pulsating motional electric fields such as are emanating from the atoms in the earth. Every piece of matter on the earth is of course such a very weak generator and receiver. What is needed in this project is something somewhat analogous to what lasers have provided for radiant energy in the form of an intense beam of concentrated coherent light. Such a generator of artificially produced gravitational waves could make anti-gravity possible. Fastened to, and directly above a space platform, such a generator with its $\underline{B} \times \underline{V}$ field acting in the opposite direction to the earth's $\underline{B} \times \underline{V}$ gravity field on the already polarized atoms in the platform would proceed to depolarize them and release them from the earth's gravitational pull. A space vehicle en route to the moon passes through such a depolarized state as the gravitational attraction of the moon on it gradually becomes equal to and oppositely directed to the earth's gravity field. If sufficiently intense, the $\underline{B} \times \underline{V}$ field form a generator might conceivably completely depolarize a space platform and make it weightless. Further intense action by the generator might conceivable repolarize it in a reverse direction. This would cause the earth's field to then act antigravitationally upward on the platform, and with controlled speed, carry it upward with not only the generator itself and operators, but with a payload!

The possibilities of obtaining free electrical power from the earth's $\underline{B} \times \underline{V}$ fields appear equally exciting. Not only from stationary land installed power plant receivers, but from receivers installed on aircraft and space vehicles. The research and experimentation needed to reduce to practice this exploitation of the earth's $\underline{B} \times \underline{V}$ fields appears to have relatively few hurdles before it. The development of ultra-high frequency rectifiers appears to be its first requirement, and there are no roadblocks on the horizon to this accomplishment! What the consummation of this project could mean for the economic development of remote, mountainous, inaccessible regions of the earth is beyond all imagination at this time. In the light of this thesis, the new horizons in field theory herald that the heritage of mankind is dominion over all the earth!

Chapter 7

Some Confirming Experiments

During the past two years the writer has devoted his full time to the task of producing experimental sources of $\underline{B} \times \underline{V}$ fields which speak for themselves. Nature has the last word in any controversy in physics and when she speaks her words are final!

A generator of a motional electric field, all electric and with no mechanical motions involved, has been built and experimentally demonstrated. This device projects its field into the space surrounding the generator. Being immune to shielding, the $\underline{B} \times \underline{V}$ field readily passes through the stainless steel walls of a grounded housing chamber. Surrounding the generator is mounted a cylindrical parallel plate capacitor. The outer plate is connected to a very sensitive vibrating capacitor electrometer (Keithley 640). The inner plate is connected to the other terminal of the electrometer, one terminal of which is grounded. Voltages are induces in these wires. The net result of these induced voltages is that the potential difference induced in that portion of the wire between the capacitor plates, charges these plates, and in doing so is measured by the electrometer. The generator, capacitor and electrometer are completely surrounded by a grounded electrostatic field. Housing them in a stainless steel box with a door has served this purpose very well.

Two papers describing the construction of the all-electric generator and the experiments performed with it have been presented to meetings of the American Physical Society. The abstracts and papers will be found in the appendix.

Figure 8

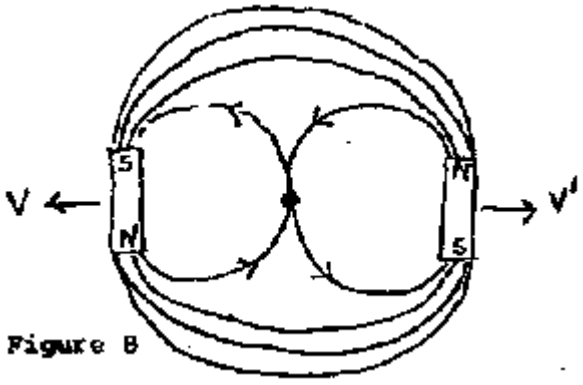


Figure 8

A simple lecture table demonstration of the pure $\underline{B} \times \underline{V}$ field is illustrated in Figure 8. Two short similar bars magnets are spaced apart as shown. Midway between them a long, straight insulated wire (surrounded by a grounded conducting shield), perpendicular to the paper is fixed with its terminals connected to a sensitive galvanometer placed outside the immediate vicinity of the magnets, say overhead. The resultant magnetic flux density B from the two magnets, at the wire, is zero by the principle of superposition. If the magnet on the left be given a slow uniform velocity V and the one on the right a velocity V' equal and opposite to V, then one will note a deflection of the galvanometer needle due to the pure induced $\underline{B} \times \underline{V}$ field acting in the wire. Note that in this simple experiment we have two sources of $\underline{B} \times \underline{V}$. Both the B and the V of each source are identical in magnitude but opposite in direction; therefore, since $\underline{B} \times \underline{V} = (-\underline{B}) \times (-\underline{V})$, the products are both positive and additive. The movement of one magnet alone will be found to yield a galvanometer deflection of half that obtained when both magnets are moved simultaneously. Note also that the wire is always in a region where $B = 0$, but where $\underline{B} \times \underline{V}$ is present and active.

One of the most fascinating aspects of our discoveries is that by the use of the phenomenon of superposition of fields, electromagnetic induction can seemingly be separated from magnetic flux energy. In other words, our all-electric motional electric field generator operates without the presence of detectable magnetic flux energy as such. It is a non-inductive device. The magnetic flux intensity has been reduced to zero by the principle of superposition, and the virtual undestroyed field associated with uncancelled flux is still active and present; hence, the name "virtual" is used to describe it. It is this virtual field which produces the pure motional electric field in the space surrounding the generator. This newly discovered pure $\underline{B} \times \underline{V}$ field is the most unique phenomenon known to electromagnetism because it is devoid of the electrostatic and magnetic field characteristics we have hitherto known. It is a $\underline{B} \times \underline{V}$ field with the resultant $B = 0$. Its immunity to shielding gives it a stature and a character of its own, beautifully unique and isolated from all hitherto known special fields! Our generator produces nothing but this pure previously unknown field!

Perhaps the closest approach to the V phenomenon inherent in our motional electric field generator, is the toroidal transformer. In this device we are dealing with a transformer type of induced electric field caused by the growth and death of flux. It is of great interest, however, to note that the wires of the secondary windings where the field is induced may be entirely existent in a region devoid of measurable magnetic flux, since $B = 0$ there. This phenomenon is always of interest to students, because the induction in the wires takes place in a region of space where, by superposition of fields the resultant magnetic flux intensity is reduced to zero without in any way impairing the electromagnetic induction of the virtual flux which is operative. It is of interest to note that our research simply extends this phenomenon to include flux cutting as well as transformer types of induction where B has been reduced to zero.

It is not surprising that many physical scientists listen to this thesis with incredulity. This is not disturbing to the author. It is but the natural path of all new discovery. Nature herself bears the burden of proof and she has spoken out clearly in behalf of the uniqueness of the motional electric field. What the role of this new electric force field will be in the future development of electromagnetism is at present an open question. Our critics point to the very small values of the induced voltages we have measured in the field of our generator. The field intensity close to our generator is at present, at room temperature, approximately of the order of $\sim 10^{-2}$ volts/meter, with a current of 30 amperes. At cryogenic temperatures, i.e., around 4.7° K, we could expect to increase the $\underline{B}$ factor in a $\underline{B} \times \underline{V}$ superconducting generator, consisting of 12,000 linear conductors, approximately 100 times. Our hope in achieving an intense $\underline{B} \times \underline{V}$ field rests, therefore, on how much we can increase the $\underline{V}$ factor in the vector product $\underline{B} \times \underline{V}$. This we know could be greatly enhanced in an electronic design of our generator. We have experimentally shown that operating our present model at the temperature of dry ice, i.e., -50° C, at high current densities, approximately doubles the value of $\underline{V}$, the electron drift velocity. Our generator is itself a unique and novel instrument for directly measuring $\underline{V}$ with considerable precision. The experimental fact that this quantity does not increase with decreasing temperature encourages us in our anticipation that in the superconducting state where all resistance to electron motion disappears that $\underline{V}$ will be very great. The author endorses the statement of Wehr and Richards (48 ~ *Introductory Atomic Physics*, p. 218, Addison & Wesley, 1962), "At absolute zero the atom would have no significant cross-section and electrons could streak through a conductor without encountering any resistance at all". Should very high values of $\underline{V}$ be realized in our cryogenic experiments, it is the writer's belief that a new era in gravitational dominion will be at hand.

Appendix: Summary of Experimental Work Done by Dr. Hooper

Figure 1: Diagram of Circuitry employed for generating & measuring the motional electric field.

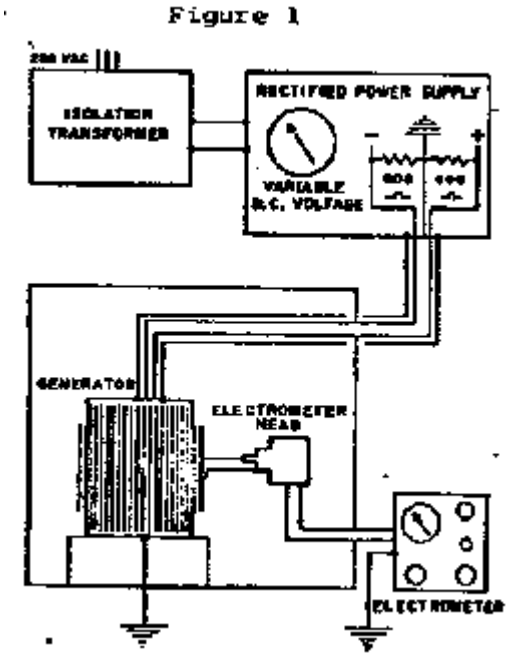


Figure 2: Capacitor Potential Differences measured as a function of DC current to the generator.

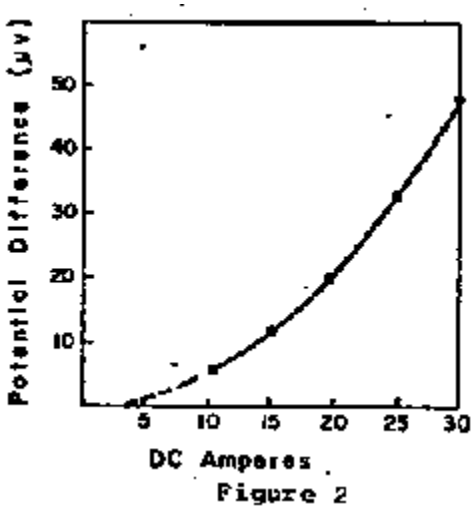


Figure 3: Capacitor potential differences measured as a function of AC current to the generator.

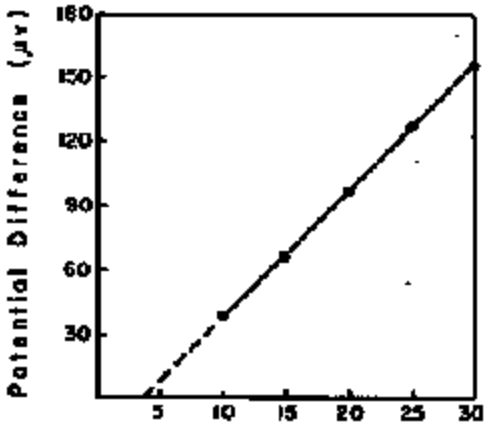


Figure 3

Similarities of the Motional Electric & Gravitational Forces

W. J. Hooper

(Professor Emeritus, Principia College, President & Director of Research, Electrodynamic Gravity, Inc., PO Box 1976, Sarasota, FL

That the magnetic flux surrounding a current-carrying linear conductor moves with the electron drift velocity is demonstrated in a motional field out into the surrounding space. This field is not electrostatic. It is immune to shielding. Magnetic flux has been eliminated. The presence of this unique, special electric field is detectable and its intensity is measurable with an electrometer. From such measurements, electron drift velocities can be directly determined. The unique properties of this field strongly suggest its equivalence to the gravitational field. If equivalence proves to be a fact, then direct absorption of gravitational field energy becomes possible for electric power without pollution. If generation in great intensity becomes possible, theory indicates that the concepts of artificial gravity is space vehicles, weightlessness in limited earthly laboratories, and even anti-gravity, or lift instead of pull from the earth's gravity, have possibilities of attainment.

Introduction

How can a force like gravity originate and emanate from atoms of matter made up primarily of three elementary particles --- electrons, protons and neutrons? Einstein wrote, "It would be a great step forward if we succeeded in combining the gravitational field and the electromagnetic field into a single structure" (1). A very considerable step in this direction may have been made by the advent of the recently invented motional electric field generator and the newly revealed properties of this field. (2)

When magnetic flux is moved perpendicularly across a conductor, we say that an emf is electromagnetically induced within the conductor. This phenomenon has been little thought of as involving the production of a spacially distributed electric field. It arises from the operation called flux-cutting; wherein the electric field is motionally induced within the space occupied by the moving magnetic flux, and is present therein, whether a conductor is present in this space or not. Correctly defined, we can say that when magnetic flux of vector intensity B is moved across

a region of space with vector velocity V, an electromagnetically induced electric field of vector intensity B x V makes its appearance in this space, at right angles to both B and V. For short, this induced field is called a motional electric field. A study of its properties is exciting.

Clerk Maxwell wrote in his description of the work of Michael Faraday that the intensity of the induced electric field "is entirely independent of the nature of the substance in which it acts" (3). The origin of this field, being electromagnetic induction, and non-electrostatic in nature, gives this field its penetrating nature which enables it to be present within either magnetic or non-magnetic conductors or insulators, entirely independent of the nature of the substance. The writer's extended experiments (4) involving shielding confirms Maxwell's description of this field.

The Motional Electric Field Generator

The motional electric field generator was designed and built to provide a device which would project a pure motionally induced electric field into the space surrounding it, devoid of electrostatic and magnetic accompaniments. It involves a newly discovered, non-mechanical method for moving magnetic flux, combined with one of the most basic and orthodox laws of physics, "the principle of superposition of fields". This principle states that in order to find the resultant intensity of the superimposed fields, each field should be treated as though the other is absent. The resultant is obtained by the vector addition of each field considered singly.

In 1820, Hans Christian Oersted discovered that a current-carrying conductor has magnetic flux looped about it. This discovery served to unify the then separate sciences of electricity and magnetism. In 1957, B.G. Cullwick (5), in a careful, thought-provoking analysis of moving charges, set forth three documented experimental fats to support the idea that the Oersted flux around a moving conduction electron should move with it. The writer had independently been led to the same conclusion. A plan for experimentally investigating this phenomenon was evolved. The design of the motional electric field generator was the result, and its production required the skill of an expert maker of generators and motors. This generator demonstrates and confirms that the Oersted flux actually does move with the electron drift velocity of the current giving rise to it. This discovery is a basic and fundamental contribution to electromagnetism. It also shows how this motion may possibly serve to explain the origin of gravitation from atoms of matter. The design of the generator itself will aid in seeing this possibility.

Momentarily, consider yourself in the place of a Maxwell demon, one who can see, from without, the planetary electrons of an atom orbiting about the nucleus. On the average, we may assume that there are as many going in one direction as in the opposite direction, in an approximate orbital plane. If these charges carry their Oersted magnetic fluxes with them, in the space surrounding an atom of matter, these moving fluxes will project an induced motional electric field, radially directed toward the nucleus.

The design of the motional electric field generator was such as to imitate in an elementary way the planetary electrons in an atom. The device involves no mechanically moving parts. It is wholly electrical.

The generator consists of 4020 insulated parallel linear conductors, #11, formvar insulated copper wire, nine inches in length, all connected in series and packed orderly side-by-side and tightly sealed together with epoxy into the shape of a solid, right circular cylinder. The series connections were accomplished by turning the wired through 180 degree angles without breaking the insulation. The two terminals connected to this composite of linear conductors are brought together at the axis of the cylinder and connected to a shielded and grounded two-wire cable. When energized by a direct current, 2010 conductors are at any instant carrying current and

magnetic flux vertically downward, and the same number of conductors are doing the same thing vertically upward. This composite cylinder is thus non-inductive with no measurable magnetic flux surrounding it. The principle of super-position of fields shows that each of the two sets of linear conductors contributes a motional electric field directed radially inward toward the axis of the cylinder. The superimposed magnetic flux from these two sets of conductors consists of horizontal circular flux loops, half directed clockwise and the other half counter-clockwise, half moving upward and half moving downward. Thus, we have a unique condition in the space surrounding the cylinder: the resultant magnetic flux, due to superposition of fields, is zero; and the resultant motional electric field intensity is $\underline{E} = \underline{B}_1 \times \underline{V}_1 + (-\underline{B}_1 \times -\underline{V}_2) = 2B\underline{1}x\ \underline{V}_1$, or double the intensity attributable to one set of conductors alone, where $\underline{B}_1$ is the magnetic flux intensity due to 2010 linear conductors and $\underline{V}_1$, the electron drift velocity in, say, the positive upward direction. Although the magnetic flux energy in this device is reduced to zero, the electromagnetic induction giving rise to what we term the motional electric field has by no means been cancelled nor reduced.

The motional electric field is projected into the space surrounding our generator when the DC current therein is 30 amperes, equivalent to that which would be associated with the uncancelled magnetic flux around a single conductor carrying a current of over 120,000 amperes (4020 x 30 = 120,600 ampere turns).

Experimental Measurements

The motional electric field intensity is studied an measured by the use of a highly insulated, stainless steel cylindrical capacitor, placed around the generator, the inner cylinder of which is grounded and the outer cylinder is connected to the input head of a Keithley 640 Vibrating Capacitor Electrometer. A diagram of the circuitry employed in operating our generator is shown in Figure 1. The generator with its cylindrical capacitor about it is placed within a large grounded stainless steel cabinet. The vibrating capacitor electrometer head is also placed in the cabinet, close to the cylindrical capacitor, and connections are made to each plate. All connecting wires between the electrometer head and the galvanometer are electrostatically protected by grounded shielding. The electrometer galvanometer is outside the cabinet and has a grounding terminal for the whole electrometer system. The vibrating capacitor in the electrometer is energized by a small storage battery built into the electrometer galvanometer case. The inner capacitor cylinder, made of 1/8" stainless steel, is insulated from the generator conductors by epoxy, and forms a partial housing. The epoxy covering the two ends of the generator is covered with a heavy coat of sprayed silver and this, with the inner capacitor cylinder, forms a completely grounded electrostatic shield around it. The motional electric field, caused by the up and down movement of the slowly moving (virtual) magnetic flux loops, induces an emf in the surrounding space and in the wire connected to the electrometer head and its ground connection. The capacitor plates are thus charged, the potential difference of which is registered by the electrometer galvanometer.

The potential difference is obtained by integrating the line integral of the electric field intensity E between the capacitor plates. It is given in mks units by:

(Eq. 1) P.D. = $/_{r1}^{r2}$ E dr = $/_{r1}^{r2}$ BxV dr = $/_{r1}^{r2}$?$_o$nIV dr/2 pi r

$$P.D. = \int_{r_1}^{r_2} E\ dr = \int_{r_1}^{r_2} BxV\ dr = \int_{r_1}^{r_2} \frac{\mu_o n I V\ dr}{2\pi r}$$

$$B = \mu_o nI/2\pi r \text{ webers/meter}^2$$

where $B = ?_o nI/2?r$ webers/meter^2 and r_1 and r_2 are the distances respectively from the axis of the generator to the outer surface of the inner capacitor plate, and the inner surface of the outside capacitor plate. Thus, we have a typical example of how we can obtain the drift velocity V, when $r_1 = 0.1$ meter, $r_2 = 0.1035$ meter, $mu_o = 4$ pi x 10^{-7}, n = 4020, I = 10 amps, P.D. = 5 x 10^{-6} volts. Integrating (1), we have:

(Eq. 2) P.D. = mu_o n IV/2 pi = $?_{r1}^{r2}$ dr/r = $mu_{o\,n}$ nIV/2 pi (ln r_2 - ln r_1)

$$\text{P.D.} = \frac{\mu_o nIV}{2\pi} \int_{r_1}^{r_2} \frac{dr}{r} = \frac{\mu_o nIV}{2\pi} (\ln r_2 - \ln r_1).$$

Solving for the drift velocity V, we have:

(Eq. 3) V = 2 pi P.D./ mu_onI (1n r_2 - 1n r_1) (meters/sec)

$$V = 2\pi P.D./\mu_o nI (\ln r_2 - \ln r_1) \text{ (meters/sec.)}$$

V = 1.78 x 10^{-2} meters/sec = 1.78 cm/sec

The classical derivation of the electron drift velocity is given by V = j/ne where *j* is the current density (j = 10/0.04172 amp/cm^2), and *n* is the number of conduction electrons per cubic centimeter, and *e* is the charge on the electron (1.6021 x 10^{-19} coul.). Using Avogadro's number, N = 6.02252 x 10^{23} for calculating, n = dN/M, where *d* is the density, 9.96 gm/cm^3, and M is the atomic weight, 63.546 gm/mole, for copper, we have

V = 239.69/(8.96 x 10^{22} x 1.6021 x 10^{-19}) = 1.762 x 10^{-2} cm/sec. A decrease of 100-fold in *n*, as indicated by Fermi-Dirac statistics would bring the experimental value of the same order of magnitude as the theoretical.

Measurements of electrometer potential differences P.D. versus direct current values *I*, when taken quickly so as to prevent appreciable change in the temperature of the generator, due to electrical heat loss, yields a most interesting curve. Typical of most of the curves is the one shown in Figure 2. The magnitude of the motional electric field intensity will be seen to be directly proportional to the virtual value of the flux B involved, and hence to the current. The value of the electron drift velocity will also be directly proportional to the current. Thus the potential difference measured versus current values yield a parabola.

It is interesting to note that when alternating current values were plotted against electrometer deflections that a straight line was obtained instead of a parabola. This is illustrated in Figure 3.

New Research Instrumentation

When improved and perfected, this motional electric field generator, together with a capacitor and an electrometer, appear to offer unique instrumentation for directly measuring the electron drift velocity in metals. Experimental values obtained with our generator are in good agreement with accepted values. Making measurements at various temperatures will afford a method of directly determining the quantity *n*, the number of free conduction electrons available per nit volume, thus affording an experimental check on the Fermi-Dirac statistics method for obtaining this quantity.

Crucial Experimental Evidence

It was, of course, necessary to run down every conceivable possible source of error. The question has been raised as to whether or not the potential difference electrometer measurements that we have observed as a function of input current to our device might arise from the thermoelectric effects instead of from the assumed $\underline{B}x\underline{V}$ field. It is true that at 30 amperes input, approximately 3300 watts of electrical power is being poured into our device, and it heats up at this rate, perceptibly to the hand, in a time interval of four to five minutes. It has been suggested that the juncture between the copper wire and the inner cylinder of the capacitor might be raised in temperature more rapidly than the juncture on the outer cylinder and thus give rise to an observed emf. To examine such a possibility, we have made a series of measurements requiring only a few seconds for each reading. Starting with a 30 ampere input, we have gone down to 25, and then to 20, 15 and 10, then back up the scale in 5 ampere steps to 30 and again back down to 10 amperes. The observed values of potential difference at each value of current were substantially identical. It does not seem reasonable to think that the innermost juncture could jump up and down in temperature values in a matter of seconds, permitting the electrometer galvanometer needle to return to its zero position immediately after each input value of current. When the device really warms up, each of the observed potential differences becomes enhanced and the plotted curves retain a nearly parabolic shape. We have, therefore, ruled out thermoelectric effects as giving rise to our observed measurements.

It has been suggested that possible non-cancelled magnetic fringing from the linear conductors acting on the innermost stainless steel cylinder might change the Fermi level of the metal and alter the contact differences of potential between the inner and outer cylinders of the capacitor. To eliminate this as a possible cause, a much larger diameter cylindrical capacitor was placed around the original one. The two plates of the first capacitor were grounded and measurements were made from the outermost capacitor alone.

The possibility that stray magnetic flux from the composite linear conductors, linking with the electrometer circuit, might give rise to the observed measurements was considered. A sensitive gaussmeter probe was employed to test for the existence of such flux. The maximum value found for such flux was of the order of half a gauss, found in one spot. To dispel all doubt, however, as to stray magnetic flux, a fairly large circuit, consisting of five wires was formed so that one side of the circuit came in radially from a distance of one foot to the central equatorial surface of the device, where it was held by tape and brought along parallel to the axis for several feet. This circuit loop was connected to a very sensitive microvoltmeter which was observed while various values of input current up to 30 amperes was sent into the linear conductors. No indication of an induced emf could be observed.

It is evident that the charging of the capacitor plates might possibly be due to charges carried by the current in the two wires leading onto the generator. If these wires are each at different potential differences with regard to the round, they carry an electric charge into the interior of the conducting housing enclosure of the generator and thus cause a charge of similar amount to appear on the outside of it and to produce a potential difference between the capacitor plates. This was experimentally confirmed by the inventor. When the generator housing was this raised to a positive potential difference with respect to ground, the electrometer deflections were to the right of center. When the housing was raised to a negative potential with respect to the ground, the electrometer deflections were to the left of center. These tests were made in two ways: (1) with no current flowing to the generator and 92) with current flowing, but one lead wire at a higher, or lower, potential with respect to ground than the other. Thus, it became evident that the two wires leading to the generator, with the grounded shielding, can be prevented from carrying a charge into the interior of the generator of the two wires are each constantly maintained at

exactly the same value of potential difference above and below ground potential. A special power supply was built to provide this requirement. The voltage of each wire entering the generator was tested for various values of current and the potential differences were found to be accurately identical, above and below ground. Now, the deflections of the electrometer for various values of current were always to the right of center, indicating a electric field directed toward the generator was charging the plates. This field could not have come from a charge on the grounded generator housing with no net charge entering the generator, since such a possibility was carefully eliminated. Thus, the electric field must be due to the predicted $\underline{B} \times \underline{V}$ field. It is always directed toward the generator. This is a distinguishing characteristic of the $\underline{B} \times \underline{V}$ when it is due to the movement of electrons. If the current were due to the movement of positrons or protons, then the $\underline{B} \times \underline{V}$ field produced would be directed away from these currents instead of towards them! Alternating current thus produces electrometer deflections to the right of zero center the same as direct current, and this can be explained only in terms of the $\underline{B} \times \underline{V}$. Had the electrometer deflections been due to electrostatic charging, the electrometer needle would have remained under the alternating impulses, 60 times each second, when AC current was used.

The argument has been advanced that the movement of the magnetic field with the free as well as the orbital electrons in a piece of metal would result in a considerably inwardly directed motional electric field in the space all around this metal piece, contrary to experience. Our reply to this argument is that the motional electric field, thus undoubtedly built up in the space around the metal, is in fact the weak gravitational field emanating from it. True, it has never been detected as an electric field, and we claim that this probably is due to its very high composite frequency nature. We know from gravitational experiments that there exists just such an inwardly directed force around the metal. We know that it cannot be electrostatic nor magnetic. Yet, it does emanate from an aggregate of electromagnetic sources. We have good reason to believe that in view of the immunity of the motional electric field to shielding that this field could provide the field agency for gravitation.

Electromagnetic Induction With Zero B Is Not New

Our generator somewhat resembles a properly wound toroidal coil in that, in the same space outside such a coil, carrying current, we know that B is zero due to the principle of superposition of fields. We know that when alternating current is surging back and forth in its coils that a non-electrostatic, electromagnetically induced electric field is present continuously in this space around it, where the magnetic field intensity is continuously zero. The resultant magnetic flux energy in our generator is reduced to zero while the electromagnetic induction due to the movement of virtual Oersted flux, in each of the two vertical directions, gives rise to what we call the motional electric field in the space surrounding the generator.

A simple experiment can be performed to convince one that electromagnetic induction takes place in a space where the resultant magnetic intensity has been reduced to zero by superposition of fields. With soft iron sheet, form a cylindrical magnetic shield about a meter in length and a few centimeters in diameter. A stiff wire should be held centrally within the cylindrical tube, and both tube and wire moved horizontally in a North and South direction across the vertical component of the earth's magnetic field, while the two ends of the stiff wire are connected to a sensitive galvanometer. A deflection of the galvanometer needle will readily measure the induced emf produced within the shielded wire, where the magnetic field intensity has been reduced to zero. The wire was not in motion with respect to the shielding magnetic flux induced in the shield, but it was in motion across the earth's vertical magnetic component. Now, hold the stiff horizontal wire stationary and move the cylindrical shielding horizontally at right angles to

its length a permissible distance, approximately that of its inside diameter. Again a deflection of the galvanometer will measure the induced emf within the stiff wire which was stationary with respect to the earth's field, but was cut by the magnetic field within the shield, which reduced the resultant field therein to zero. If accurately measured, the emf induced in the shielded wire will be found identical for the same movement when no shield at all is employed. In one case, B = 0; in the other case, it is a real measurable value.

Mechanical Generation & Confirmation

The special distribution of motional electric field directed radially about the equatorial region of the generator was explored by means of a squirrel cage-like rotor, made up of parallel electromagnets all similarly directed so that, in some respects, it simulated the rotation of a unipolar magnet about its magnetic axis of symmetry. This apparatus is by no means such a magnet because its design is such to preclude a symmetrically uniform distribution of magnetic flux about its rotational axis. The rotation of this system of electromagnets affords an interesting experiment because here we have loops of magnetic flux of constant intensity completely filling the space about the rotor, all similarly directed from one end of the system to the other, and all in rotation about the same axis with the same angular velocity, and having a definite and constant flux pattern in space, not symmetrical nor uniform in the sense of a unipolar magnet though in a sense simulating one. That this magnetic field system rotates was readily demonstrated by means of a rectangular pickup coil placed close to the rotor and parallel to the array of electromagnets. When rotating at a speed of 10,000 rpm an AC voltage of 15 volts was obtained due to the humps of similarly directed magnetic flux which entered and left the coil. With a very sensitive zero-centered voltmeter, one could rotate the rotor by hand and demonstrate the rotation of the flux very visibly. A semi-cylindrical capacitor was next placed over the top of the rotor, with two wires centrally and radially directed (from the rotor axis) to an electrometer. In this experiment, the wires from the capacitor plates to the electrometer are cut by the unidirectionlly rotating magnetic flux which induces the motionally induced emf in this space, and is detected and measured by the DC voltage to which the capacitor plates are raised. With this apparatus one can demonstrate that rotation of the rotor in one direction yields a radial inwardly directed motional electric field, while rotation of the rotor in the opposite direction reverses the direction of the motional electric field, thus demonstrating the vector nature of the field by changing the sign of $\underline{V}$ in the vector product $\underline{E} = \underline{B} \times \underline{V}$, and $-\underline{E} = \underline{B} \times (-\underline{V})$. By keeping a constant rotation and reversing the direction of the current to the electromagnets, the direction of $\underline{B}$ can be changed while $\underline{V}$ is held constant. In this manner the direction of the motionally induced electric field can also be reversed in the surrounding space and can be made either radially inward or radially outward as evidenced by the zero-centered galvanometer needle of the Keithley 640 vibrating capacitor electrometer which was used to make the DC voltage measurements. The demonstration that a spacially distributed motional electric field exists around either our mechanical or our all-electric generator appears to us to be amply demonstrated. To be more certain, however, we obtained the services of a disinterested expert in electronics measurements to come in and check our work with a sensitive Tectronic electron oscillograph, which confirmed our observations with the Keithley Electrometer.

Relation To Relativity

The question arises as to how this new field fits into the Relativity theories? It definitely provides an interesting clarification of a hitherto speculative deduction which many relativitists have ventured to make with respect to the $\underline{V} \times \underline{B}$ motional electric term which enters into the transformation equations of the Special Theory as applied to electrodynamics. It has been claimed that this $\underline{V} \times \underline{B}$ term is electrostatic in its fundamental nature. This conclusion is now

definitely shown to be incorrect by the advent of the new motional electric field generator, the field of which emanates from a grounded conducting metallic container and passes readily through any shield. The non-electrostatic nature of the $\underline{V} \times \underline{B}$ has also been pointed out by Winch: "Notice that the $\underline{E}$ of ($\underline{E} = \underline{V} \times \underline{B}$) is not an electrostatic field intensity for it is not due to a distribution of charges" (6). Nature has definitely not limited us to one type of electric field. The motional electric field is different in origin and fundamental properties from the electrostatic field arising from charges.

The writer embraces the position taken by Sir James H. Jeans in his explanation of the Special Theory of Relativity and its bearing upon the two electric fields in the transformation equations. He points out that there is nothing in the postulates of the Special Theory that requires a physical interpretation of the two electric field terms $\underline{E}$ and $\underline{V} \times \underline{B}/c$ in the transformation equation $\underline{E}' = [\underline{E} - (l/c)\ \underline{V} \times \underline{B}]$. He states: "The equations may be taken merely as expressing relations between quantities as measured by the observer S and another S' moving with a velocity $\underline{V}$ relative to S" (7). Thus we see that there is no conflict with the Special Theory of Relativity. The philosophy of the Nobelist, P. W. Bridgman, whose "Operational Viewpoint" as set forth in his text, *The Logic of Modern Physics* (8), has guided the inventor in his work on this project. As Bridgman predicted, it has led to new and fundamentally basic knowledge.

That the gravitational field may possibly be identified as a motional electric field is at least very strongly suggested by the experimental work described herein. The claim of the General Theory of Relativity that the Gravitational field is equivalent to that of centrifugal force would appear to be a concept far removed form that of presenting it as a motional electric field. The experimental fact remains, however, that a pure motional electric field projected into space does simulate, in some respects, the gravitational field.

When the current flowing into this generator is constant, the motional electric field surrounding it is also constant and static, but not electrostatic, because it does not originate or terminate on charges. It readily passes through two 1/8" thick sheets, or 1/4" of stainless steel, constituting the cylindrical capacitor plates. The exciting thing about this generator is that it throws this $\underline{B} \times \underline{V}$ electric field out into the space around it. It is not electrostatic, not magnetic, and is immune to shielding. These properties make it a unique force in nature with possibly great utility to mankind.

Polarization & Absorption

Objects placed in this field are electrically polarized, and in making measurements of its intensity, the electrostatic fields arising from such polarization have to be reckoned with. From a well-known general theorem (9) we know that an intense convergent motional electric field would be attractive on any material object placed within it, due to this internal polarization. The recent experimental work of L. Brauner on the electric polarization due to gravity, is most interesting, as reported in the January 1969 issue of *Endeavor* magazine (10). His experiments convincingly show that the shoots and roots of plants when lying in a horizontal plane become electrically polarized. When turned into a vertical plane, this polarization soon disappears. Brauner presents excellent evidence in support of the conclusion that this phenomenon is due to the electrical nature of the earth's gravitational field.

This indicates in a limited way direct absorption of gravitational field energy. Of course, our hydro-electric plants are utilizing this energy in large quantities where advantageous sites for such plants can be found. The greatest potential inherent in the research described herein, the writer believes, will ultimately be in the direct absorption and conversion into useful electric power the vast reservoir of gravitational field energy which as yet has hardly been tapped. The

insight into what we believe to be the mechanism within atoms which gives rise to the phenomenon of gravity, encourages us in the conviction that we can directly absorb and convert it to the service of mankind. Our research in this direction has commenced and is very encouraging.

Spacewise, this project has some speculative possibility, if and when this generated field can be made sufficiently intense. We have very considerable reason to believe that by the use of superconducting wire and liquid helium temperatures, this can be accomplished. To what extent is speculation at present, but theory would indicate that if intense fields are ever possible of generation, then the phenomenon of changing the weight of objects, and of even producing weightlessness and anti-gravity (that is, lift instead of downward pull on objects) would be possible.

Domestic and foreign patent applications covering the various generators and devies employed in our work have been field and some have been granted.

References

(1) Albert Einstein: *Essays in Science*, p. 10, Philosophical Library, NY,1934.
(2) W. J. Hooper: "Equivalence of the Gravitational Field and a Motional Electric Field"; Proceedings of the Boulder Conference on High Energy Physics, Division of the American Physical Soc., Aug. 18-22, 1969, p. 483; "The Motional Electric Field Generator"; *Bull. of the American Physical Soc*., February 1970, p. 207.
(3) Clerk Maxwell, *Electricity & Magnetism*, p. 181, vol. II.
(4) W. J. Hooper: *New Horizons in Electric, Magnetic & Gravitational Field Theory*, Principia College Library, Elsah, IL.
(5) E. G. Cullwick: *Electromagnetism & Relativity*, p. 245; Longsman, Green & Co., 1957.
(6) Ralph P. Winch: *Electricity & Magnetism*, 2nd Edition, p. 399, Prentice Hall, Inc., 1963.
(7) J. H. Evans: *Mathematical Theory of Electricity & Magnetism*, p. 606; Cambridge Univ. press, 4th Edition, 1923.
(8) P.W. Bridgman: *The Logic of Modern Physics*; Macmillan Co., 1928.
(9) Jeans, *op. cit*., p. 125; illustrated by a block of dielectric material being sucked in between two charged capacitor plates.
(10) L. Brauner: "The Effect of Gravity on the Development of Electric Potential in Plant Tisues"; *Endeavor*, Jan. 1969.

John HUTCHISON The "Hutchison Effect"

John Hutchison Website: hutchisoneffect.org

Mark A. Solis: "The Hutchison Effect -- An Explanation"
Abstract: "The Hutchison Effect"; Proceedings of the International Symposium on New Energy -- Denver, Colorado, USA (April 16-18,1993)
Albert Budden: "The Hutchison Effect: A Lift, Disruption & Luminous Energy System"
Lance Cleveland: "The Dirt Cheap Rocks of John Hutchison"
"John Hutchison, The Wild Scientist From Vancouver"

Mark Solis & John Hutchison: "Successful Replication of The Hutchison Effect" (10 October, 1998)
Mark Solis: "John Hutchison Raided At Gunpoint By Canadian Police" (18 March 2000)
Interview with Mel Winfield (Claimant to Hutchison Effect) --- PDF Format

Videos: [1] -- [2] -- [3]

The Hutchison Effect -- An Explanation

by

Mark A. Solis

People often ask, "What exactly is the Hutchison Effect?"

This brief essay is an attempt to answer that question to the satisfaction of the majority.

First of all, the Hutchison Effect is a collection of phenomena which were discovered accidentally by John Hutchison during attempts to study the longitudinal waves of Tesla back in 1979. In other words, the Hutchison Effect is not simply a singular effect. It is many.

The Hutchison Effect occurs as the result of radio wave interferences in a zone of spatial volume encompassed by high voltage sources, usually a Van de Graff generator, and two or more Tesla coils.

The effects produced include levitation of heavy objects, fusion of dissimilar materials such as metal and wood (exactly as portrayed in the movie, "The Philadelphia Experiment"), the anomalous heating of metals without burning adjacent material, spontaneous fracturing of metals (which separate by sliding in a sideways fashion), and both temporary and permanent changes in the crystalline structure and physical properties of metals.

The levitation of heavy objects by the Hutchison Effect is not---repeat not---the result of simple electrostatic or electromagnetic levitation. Claims that these forces alone can explain the phenomenon are patently ridiculous, and easily disproved by merely trying to use such methods to duplicate what the Hutchison Effect has achieved, which has been well documented both on film and videotape, and has been witnessed many times by numerous credentialed scientists and engineers. Challengers should note that their apparatus must be limited to the use of 75 Watts of power from a 120 Volt AC outlet, as that is all that is used by Hutchison's apparatus to levitate a 60-pound cannon ball.

The fusion of dissimilar materials, which is exceedingly remarkable, indicates clearly that the Hutchison Effect has a powerful influence on Van der Waals forces. In a striking and baffling contradiction, dissimilar substances can simply "come together," yet the individual substances do not dissociate. A block of wood can simply "sink into" a metal bar, yet neither the metal bar nor the block of wood come apart. Also, there is no evidence of displacement, such as would occur if, for example, one were to sink a stone into a bowl of water.

The anomalous heating of metal without any evidence of burning or scorching of the adjacent materials (usually wood) is a clear indication that possibly the nature of heat may not be completely understood. This has far-reaching implications for thermodynamics, which hinges entirely on the presumption of such knowledge. It should be noted that the entirety of

thermodynamics is represented by the infrared portion of the electromagnetic spectrum, which is insignificant in a context of 0 Hz to infinite Hz. The anomalous heating exhibited by the Hutchison Effect shows plainly that we have much to learn, especially where thermodynamics and electromagnetism meet.

The spontaneous fracturing of metals, as occurs with the Hutchison Effect, is unique for two reasons: (1) there is no evidence of an "external force" causing the fracturing, and (2) the method by which the metal separates involves a sliding motion in a sideways direction, horizontally. The metal simply comes apart.

Some temporary changes in the crystalline structure and physical properties of metals are somewhat reminiscent of the "spoon bending" of Uri Geller, except that there is no one near the metal samples when the changes take place. One video shows a spoon flapping up and down like a limp rag in a stiff breeze. In the case of permanent changes, a metal bar will be hard at one end, like steel, and soft at the other end, like powdered lead. Again, this is evidence of strong influence on Van der Waals forces.

The radio wave interferences involved in producing these effects are produced from as many as four and five different radio sources, all operating at low power. However, the zone in which the interferences take place is stressed by hundreds of kilovolts.

It is surmised by some researchers that what Hutchison has done is tap into the Zero Point Energy. This energy gets its name from the fact that it is evidenced by oscillations at zero degrees Kelvin, where supposedly all activity in an atom ceases. The energy is associated with the spontaneous emission and annihilation of electrons and positrons coming from what is called "the quantum vacuum." The density of the energy contained in the quantum vacuum is estimated by some at ten to the thirteenth Joules per cubic centimeter, which is reportedly sufficient to boil off the Earth's oceans in a matter of moments.

Given access to such energies, it is small wonder that the Hutchison Effect produces such bizarre phenomena. At the present time, the phenomena are difficult to reproduce with any regularity. The focus for the future, then, is first to increase the frequency of occurrence of the effects, then to achieve some degree of precision in their control.

The work is continuing at this time. Before long, we shall see what progress can be made.

Shreveport, Louisiana
February 16, 1999

Copyright (c) 1999 by Mark A. Solis

The Hutchison Effect

Proceedings of the INTERNATIONAL SYMPOSIUM ON NEW ENERGY

Denver, Colorado, USA (April 16-18,1993)

John Hutchison of Vancouver, Canada, tinkered with an array of simultaneously interactive fields; a combination of electrostatic, magnetic, microwave and Tesla Coil fields. Without predictable warning and with some randomness, these fields interacted with objects. Levitations, thrusted weights, glowing, apparent softening and bending of hard metal alloys, and strange alloy separations were some of the phenomena reported. Some events were witnessed and reported by

George Hathaway." Additional details of the experiments are related in the *Electric Spacecraft Journal*. One series of experiments was performed while observers from Los Alamos Laboratory, U. S. aircraft firms, and military personnel observed and made video camera recordings. There is no doubt that things happened which were dffficult to explain. However, the experimental procedures were such that John Hutchison would try various combinations of pulsed power, microwaves, etc., without records to correlate what caused what. The best that could be done at the time was to observe. There is no claim of electrogravitic forces here, but massive objects were said to have moved, presumably as a result of the externally applied fields. Mr. Hutchison claimed that the presence of heavy masses was important in his levitation experiments. The phenomenon generated by Mr. Hutchison requires more investigation.

References:

George Hathaway: "The Hutchison Effect --- A Lift and Disruptive System" (1988) ---Paper presented and published by the Planetary Association for Clean Energy, Hull, Ontario, Canada. Andrew Michrowski, Editor. Available from (PACE): http://pacenet.homestead.com

Jeanne Manning (1992): "Rainbow in the Lab: The Hutchison Story," *Electric Spacecraft Journal*, Issue #4, April 1992, pages 13-20.

THE HUTCHISON EFFECT: A LIFT, DISRUPTION AND LUMINOUS ENERGY SYSTEM

Albert Budden

The original way that Hutchison set out his range of apparatus was, by industrial standards, primitive and crowded, with poor connections and hand-wound coils. But it was with this layout with its erratic standards that he obtained most of the best examples of objects levitating, despite the fact that the maximum power drawn was 1.5 kilowatts, and this from the ordinary power sockets of the house mains. The Hutchison device produces effects which can basically be divided into two categories, propulsive and energetic. It can induce lift in objects made of any material and also propel them laterally.

It has been noted that there are four types of trajectory that affect objects weighing a few pounds, and all of these upward movements begin with a twisting spiral movement. Also, there has to be a particular geometry in relation to the direction of gravity, i.e., downwards of these objects, for them to be affected in this way. Some objects will not take off if you turn them on their sides, but will if you stand them on their ends. It is evident, therefore, that the relationship of their physical forms to the fields which swirl invisibly around them is important. Returning to the four modes of trajectory, first, there is the looping arc, where objects take off relatively slowly over a period of seconds, loop in the air and fall back to earth; then there is the ballistic take-off where objects shoot upwards suddenly, hit the ceiling and fall back down. A third type of trajectory is a powered one where there appears to be a continuous lifting force; and the fourth is where an object moves upwards and just hovers for some time. As mentioned, these objects can be of any material whatsoever --- wood, plastics, copper, zinc, Styrofoam, etc. It must be mentioned that 99 per cent of the time the objects do nothing at all, and one can wait for days

before anything happens, but it is just this erratic unpredictability that one finds when investigating poltergeist activity.

Another major area of activity is the disruptive phenomenon where materials are destroyed. Hutchison has a collection of metal samples which have been broken and/or deformed, indicating that high energy levels are involved, as mentioned before. As one may imagine, this device has attracted intense interest from a variety of professional, academic and industrial sources, not to mention covert military attention. In the USA, a respected and well-qualified electrical engineer, George Hathaway, has taken on the research and development of the device. As explained, although the device has many interrelated parts, it acts as a single entity. Of the disruptive effects on metals and other materials he relates: "The disruption part of this...system has produced confirmatory physical samples that include water, aluminum, iron, steel, molybdenum, wood, copper, bronze, etc... We have tested various pieces that have broken apart, for hardness, ductility, etc. We have used optical and electron microscopes. "Two samples of aluminum... one of which is twisted up in a left-handed spiral...and another which was blown into little fibres...molybdenum rods which are supposed to withstand temperatures of about 5,000 degrees F... We watched these things wiggle back and forth... In general, a collection of pieces of metal shows that they have been blasted apart or twisted..."

In domestic settings where 'poltergeist' activity is usually observed, metal-bending and deformities take place with less vigour --- which is to be expected due to the accidental field configurations produced as electromagnetic pollution from power lines, radio transmitters, civilian radar, etc., interacts with Earth energies --- otherwise known as geomagnetic and geoelectric fields&emdashat locations inadvertently built over fault lines. The following example taken from a well-known case in the UK --- the Enfield poltergeist --- shows a typical instance of metal- bending: "It was 10.15 am on 6 December 1977. Janet was leaning on the kitchen worktop, and her mother was sitting down. Both were out of reach of the stove. Suddenly, they both heard a noise coming from the teapot --- the same metal one that Grosse had seen rocking in front of his eyes. Mrs Harper picked up the pot and found that its stout metal lid had arched upwards, just as the spoons had done, bending right out of shape so that it no longer fitted the pot. I took the lid in both hands, and even using considerable force I was unable to bend it back."

Hathaway, in his descriptions of metal deformity, clearly gives the impression of intense energies at work: "The largest piece [of metal] is about 12-13 inches long. It's two inches in diameter, of regular mild steel, and a 3/8 of an inch long part was blasted off the end and crumbled like a cookie." However, even the domestic 'poltergeist' displays phenomena where extremely high energy levels are involved, although in the following example, also from the Enfield case, we get the impression that more conventional high-magnetic-field densities are involved: "Mr Playfair...was already on his feet and standing in the doorway of their bedroom, wondering if he was seeing things. "The entire iron frame of the gas fire had been wrenched out of the wall, and was standing at an angle on the floor, still attached to the half-inch-diameter brass pipe that connected it to the mains. The pipe had been bent through an angle of thirty-two degrees. This was a major demolition job, for the thing was cemented into the brickwork, and it was out of the question to suggest that one of the children could have wrenched it out. When we finally dismantled the whole apparatus, we found it quite a job even to move. It must have weighed at least fifty pounds." [3]

We may ask ourselves what new directions for investigation into 'poltergeists' are open to us in the light of the Hutchison Effect. Startling as it may seem, an answer is there ready-made for us in the almost matter-of-fact information that Hathaway supplies: "Fragments have been analyzed and found to have an anomalously high silicon content, although the original material was not

silicon steel...a standing piece is 5-6 inches tall, 1 and 1/4 inches in diameter and is a piece of case-hardened steel... The case-hardening has been blown off at the top and about 3/4 of an inch of it vaporized during an experiment...a piece of iron was analyzed for composition which showed anomalously high amounts of copper...wood particles were also found inside a piece of aluminum..."

Evidently, the energies involved are able to reorganize materials in a way that is virtually impossible by any other means, but we are now provided with a previously unheard-of perspective. From the Hutchison experiments, it is clear that an analysis of the composition of metals at the 'poltergeist' site, in order to detect similar mixture-anomalies, is an essential investigative procedure. Although we may shelve theories of psychokinesis and separate them out from 'poltergeist' activity as belonging to dice-throwing experiments or the spoon-bending of Uri Geller, the weird physical antics of the mixing and matching fields of the Hutchison Effect provide us with something far stranger. This underscores the point made earlier that although it sounds as if the enigma of the 'poltergeist' is being diminished by identifying it as electromagnetic field activity, in actual fact the mystery is merely being redirected. Physicists and electrical engineers should now reconsider the nature of severely modulated electromagnetic fields, for there are evidently previously unrealized potentials. The energies involved in the Hutchison Effect are clearly the same ones at work during 'poltergeist' activity, and it is only the ignorance and entrenched positions of the psychical research fraternity that prevent them from accepting these insights into electromagnetic energy potentials. These energies include weird thermal effects. During Hutchison's experiments, flames have been produced and emitted from blocks of concrete, and fires have broken out in different parts of the building where the device was housed. Again, these effects are typical of 'poltergeist' reports. On one occasion, a steel file was held in place against a wooden board by two plywood struts, to prevent it taking off. The file glowed white-hot, but the board when examined afterwards was not even singed. Such mischievous thermal antics of 'phantom arsonists' have been attributed to the 'spirit energy of the poltergeist', whatever that may be, but Hathaway's warnings are more to do with effective safety practices in the laboratory: "From time to time there are scorch marks on the boards from other experiments. The apparatus makes fire spontaneously in parts of the lab, if you're not careful."

The device can also induce unusual aurora-like lighting effects in mid-air. Once when Hutchison was filming in 1981, a sheet of iridescence suddenly descended between the camera and some of the hardware being used. It had a strange pinkish center to it, and after it hovered there for a short period it vanished just as suddenly as it had appeared. Hutchison actually thought he had been hallucinating, but when the film was developed it transpired that there had actually been something objective there. Once again, the Enfield case provides us with comparable examples of strange, luminous phenomena in a domestic setting, and in this extract they are accompanied by other typical phenomena also explainable within the Hutchison Effect: "The Harpers hoped to find some peace and quiet in the Burcombes' house, but it was not to be. From the kitchen Sylvie suddenly let out a piercing scream and dropped the kettle she was holding. It was some time before she could calm down enough to describe what had happened. 'I was just pouring the water from the kettle into the teapot,' she said, 'when something appeared right in front of my eyes and then dropped onto the kitchen unit top, and bounced once.' It was a plastic rod, about six inches long, from one of the children's toy sets. 'I sort of looked down, opened my eyes, and this thing was in front of me,' she told Grosse when he arrived shortly afterwards. 'I screamed, shouted and jumped back, and after I jumped back I saw the thing jump and come up again.' "Grosse questioned Mrs Burcombe very carefully about this incident, which seemed to be a genuine case of one of the rarest of all psychic phenomena: materialization. The

plastic rod had definitely not been thrown at her, she insisted. It had just appeared in front of her eyes and dropped down... But he had already seen too much, in both his own and his sister's homes. He had watched open-mouthed as a lamp slowly slid across a table and fell to the floor, vibrating violently. He had seen a drawer open by itself. He had felt an invisible force stop him closing his own bedroom door, which simply stuck half-closed though it normally swung shut on its own. And he had seen something far more alarming as he stood one day at the bottom of the Harper's staircase, looking up it. 'I saw this light,' he said. 'It was the equivalent, I should say, of twelve inches vertical. It looked like a fluorescent light behind frosted glass, which burned fiercely and gradually faded away'..." [4]

With the insights gained from what is possible during operation of the Hutchison device, coupled with my own findings that 'poltergeist' activity takes place at locations that are electromagnetic hot-spots, we can begin to understand what is going on in such cases. Unusual light phenomena can occur, and on consulting Burke's *Handbook of Magnetic Phenomena* we find several mechanisms documented where magnetic fields interact with light to produce specific optical effects that are predictable in laboratory conditions, but are obviously most startling when they occur spontaneously in domestic settings. Having stated this, however, the sheet of iridescent light which appeared during Hutchison's experiments also came as an unexpected and surprising phenomenon. In the extract given above, it is not difficult to rethink the apparent materialization of the plastic rod as a typical trajectory of the Hutchison Effect, observed many times and recorded on video. Likewise, the lamp slowly sliding across the table and vibrating could have come straight out of the catalogue of effects similarly induced. In fact, compared with the extreme effects that Hutchison can obtain with his device, domestic 'poltergeist' phenomena which previously seemed so dramatic, now seem quite tame. But as already noted, this lessening of effect is consistent with the fact that the Hutchison device involves a concentrated collection of devices which appear to act as a single entity, whereas an electromagnetic hot-spot occurs by the chance juxtaposition of freak environmental field sources. Unfortunately, the investigators present during the 'poltergeist' activity at Green Street, Enfield, England, in the late 1970s, did not carry out a thorough field survey or identify the field sources involved, despite the fact that a magnetometer registered distinct deflections as objects were 'thrown' across the room. In fact, there is the distinct impression that, for them, electromagnetic fields were not a welcome explanation for the phenomena they witnessed, as the Playfair book relates how they discontinued use of the magnetometer once it showed that power surges occurred in conjunction with physical phenomena: "When everybody was settled into bed, we switched on both tape recorders, Eduardo's being connected to the signal from the magnetometer, and left the room, since I had told him that nothing would happen if we both stayed there. From the landing we could keep an eye on the dial of the machine, and in the following forty minutes Janet's pillow was twice thrown across the room just as it had been the previous evening in my presence. This time, of course, I could not see Janet, although Mrs Harper assured me at once that she had not thrown it. And each time the needle on the magnetometer did indeed deflect, though Eduardo thought this might have been caused by creaking bedsprings." [5]

It is difficult to understand how bedsprings could cause power surges strong enough to register on a magnetometer (I, myself, have used many types of these instruments during investigations), and even more difficult to understand how they could induce deflections which happened to coincide with the movements of objects. Also, it's a wonder the investigators did not eliminate this as an option, if they thought it was possible, by simply moving the instrument away from the bedsprings. Magnetometers are of course designed to withstand the effects of magnetic fields, and so it is even more puzzling why the following reasoning and actions were employed: "I was

a little worried that he might have to go back to his university and report that the expensive instrument he had borrowed without permission had broken down, so we called off the experiment once we were satisfied that it seemed possible that there was some link between poltergeist activity and anomalous behavior of the surrounding magnetic field." [6]

One of the primary investigators of the Green Street 'poltergeist' in Enfield, North London, was Maurice Grosse, who has given many lectures on his experiences and is now regarded as one of the leading authorities on this kind of phenomenon. On the whole, 'poltergeists' are regarded as discarnate and mischievous entities who home in on the energies of an adolescent focus and who unintentionally wreak havoc wherever they go, although particular locations are usually favored for the most spectacular phenomena. In the course of my career as an investigator, I have discovered that 'poltergeist' activity takes place in electromagnetic hot- spots, and is electromagnetic in nature. However, 'poltergeist expert' Maurice Grosse takes a different view: "Albert's enthusiasm for his suppositions does him credit, but...displays a distinct lack of practical experience of psychic phenomena... I look forward with great interest to the day when flying boxes, stones, toys, heavy items of furniture, plus spontaneous fires and water phenomena, together with the passage of matter through matter, levitation, metal bending, to name just a few examples of poltergeist high jinks I have personally experienced, can be explained by electromagnetic and bioelectromagnetic activity."7 Well, Maurice, this is the day you have been waiting for! In fact, it was "the day" over 15 years ago when Guy Lyon Playfair's book on the Enfield 'poltergeist' was published in 1981 in the UK, when at the same time on the other side of the world in British Columbia, Canada, John Hutchison's device was just getting underway and generating all of the physical 'poltergeist' activity you were considering.

ELECTROMAGNETIC HYPERSENSITIVITY

This is not the place to fully expound my own biological research into how the human body reacts to prolonged field exposure, except to say that the body eventually acts as an oscillator and can add to the electromagnetic mayhem generated at hot spots. That is to say, I would add to the Hutchison Effect by including my own findings, as outlined in my books, which point to 'poltergeists' being electromagnetic phenomena, and my conclusion that there is a bioelectromagnetic aspect where the human body behaves as another piece of electrical apparatus or hardware and re-radiates generalized ambient fields in more beam-like, coherent forms. This is a symptom of an increasingly common clinical condition known as electromagnetic hypersensitivity (EH), caused by exposure to electromagnetic pollution from power lines, transmitters, etc. The condition was the subject for an international conference of medical specialists and academics at Graz, Austria, in 1994. It is treated at the Breakspear Hospital in Hertfordshire, England. However, nobody in psychical research here in England seems to be aware of EH or the work of John Hutchison, and there are fixed ideas which are protected with a religious fervor. Freak electromagnetic field conditions which seem to stretch the laws of physics to almost breaking point are not a welcome conclusion, although the history of science is littered with painful upheavals where the established view is turned on its head, and iconoclasts like myself and, unwittingly, John Hutchison, threaten the status quo. For example, Dr John Beloff, the Editor of Anomaly, the respected journal of the Society of Psychical Research, wrote to me to tell me: "Whatever the relevance of exposure to EM radiation...it has no obvious bearing on psychic experiences in general." Having investigated reports of apparitions and 'poltergeists' in hot-spot locations for over three years, and measured the fields present with my trusty field meter, this statement made no sense at all. Perhaps the reader will have some inkling of the sort of establishment opposition I am up against, or may even refuse to believe the Hutchison Effect themselves. However, it must be remembered that a number of

well-known electrical engineering organizations have been involved. For example, McDonnell-Douglas Aerospace and the Max Planck Institute in Germany, both took many photographs, some of which appear here. I anticipate that there will be a wave of controversy as a result of this article, if the reactions here in the UK are anything to go by, and I would be interested in any constructive suggestions that readers may have.

Endnotes:

1. Burke, Harry E., Handbook of Magnetic Phenomena, Van Nostrand Reinhold Company, NY, 1986.
2. Playfair, Guy Lyon, This House Is Haunted, Sphere Books, UK, 1981, p. 113.
3. ibid., p. 62.
4. ibid., p. 45.
5. ibid., pp. 77-78.
6. ibid.
7. *Anomaly*, Journal of the Association for the Scientific Study of Anomalous Phenomena, UK, vol. 17, November 1995.

About the Author: Albert Budden, B.Ed., is an investigator specialising in the scientific study of the paranormal as well as electromagnetics and health. He is the author of several books, including Allergies and Aliens: The Visitation Experience-An Environmental Health Issue (Discovery Times Press, 1994), UFOs: Psychic Close Encounters- The Electromagnetic Indictment (Blandford, 1995), and The Poltergeist Machine: The Hutchison Effect-A Lift and Disruption System (Discovery Times Press, 1996). He is a member of the Environmental Medicine Foundation.

Item # 0002091 - LEVITATION, THE HUTCHISON EFFECT, JOHN HUTCHISON, SCIENTIST --- One hr video $12.00. This brilliant scientist discovered how to manipulate the environment to have tangible items levitate without human interaction. His discovery is simply named, The Hutchison Effect. This show updates his pursuit to expand on his 1979 success and shows footage of his work. What an opportunity to see him tell his story and show his stuff. A keeper! **Order at http://www.elainesmitha.com/Science.html**

Source: http://www.beyond-the-illusion.com/files/New-Files/980930/scienceOfFreeEnergy.txt

The Dirt Cheap Rocks of John Hutchison

by

Lance Cleveland

If you ask the other residents of a certain apartment building in Vancouver, they may admit to being curious about John Hutchison. They see a tall, muscular man who carts old consoles of electronic equipment onto the elevator nearly every week. Their curiosity increased the day a Japanese television crew showed up and disappeared inside his apartment for a few hours. And

in the summer of 1995, Hutchison further puzzled onlookers by sitting on the curb and picking out stones, Why would a rockhound sort through ordinary street rocks?

What the neighbors do not know is that John Hutchison is well-known in new-energy circles, and is even known to some who move in the circles of established science. His visitors have included distinguished physicists. But unlike Shoulders and Lambertson, he is a self-taught scientist. As a boy in Vancouver, he read about Nikola Tesla and then startled neighbors with Tesla coil experiments in his backyard.

While in his twenties, he developed a medical problem that resulted in his living on a small disability pension. For years, he lived a generally reclusive life, digging for rare electrical equipment in military surplus stores and junkyards, and carrying his finds home on the city bus. Apart from time spent as a volunteer at a local ecology center, he spent hours in his bedroom-turned-laboratory, patiently rebuilding equipment. He considered opening a museum.

Antigravity and the Hutchison Effect

Hutchison's life changed drastically in 1979 when, upon starting up an array of high-voltage equipment, he felt something hit his shoulder. He threw the piece of metal back to where it seemed to have originated, and it flew up and hit him again. This was how he originally discovered the Hutchison effect. When his Tesla coils, electrostatic generator, and other equipment created a complex electromagnetic field, heavy pieces of metal levitated and shot toward the ceiling, and some pieces shredded.

What is the Hutchison effect? As with much of the new-energy field, no one can say for sure. Some theorists think the effect is the result of opposing electromagnetic fields cancelling each other out, creating a powerful flow of space energy.

A Vancouver businessman heard about the Hutchison effect, contacted Hutchison, and brought in a consulting engineer to form a company that would promote technology developed from the effect. Despite demonstrations to potential customers from both Canada and the United States, things did not work out, and Hutchison and the company parted ways in 1986.

After a couple of other abortive business tries, including a sojourn in Germany, Hutchison returned to Vancouver in late 1990 and again lived a relatively reclusive life. Piece by piece, he sold what remained of his laboratory equipment in order to pay his bills. It would be several years before he could reestablish his collection.

Hutchison wanted to connect with other researchers, but the local media had given his work the weird-science treatment, and didn't take him seriously. However, material on the Hutchison effect was included in a Japanese book on Hutchison's life and work that sold well in Japan. Living in a country with almost no natural resources has led the Japanese to take new-energy ideas very seriously, as we will see in Chapter 8.

As a result, Hutchison was asked to speak in Japan, where thousands of people paid to attend his two lecture tours. These tours were organized by Hiroshi Yamabe, a well-known Tesla lecturer who made his fortune in such advanced engineering fields as robotics and artificial intelligence. Yamabe offered to set up a laboratory for Hutchison, but the Canadian was ambivalent about the prospect of moving to Japan.

Beyond the Hutchison Effect: The Dirt Cheap Energy Converter

Hutchison was undecided about what to do. He had moved beyond the Hutchison effect and into the field of space energy, and had acquired a Canadian business manager. The winter before his 1995 Japanese tour, Hutchison built a working space energy device about the size of a

microwave oven. The Hutchison Converter was based on Tesla's resonance principle. Tesla demonstrated this principle by steadily pulsing bursts of energy into his electric coils, each burst coming before energy from the previous burst had time to die away. This led to higher and higher amounts of energy, like a child going higher and higher on a swing.

Hutchison captured the same pulsing, rhythmic energy by using crystals of barium titanate, a material that can capture the pulses of certain electromagnetic frequencies in the way that a radio can pick up certain radio frequencies. When the crystal pulses, or resonates, it produces electric power.

I saw a demonstration in which the converter put out six watts, enough to power a motor that kept a small propeller spinning furiously. The whirring of a tiny propeller looked rather silly, until one realized that the apparatus contained no batteries, no fuel, and no connection to a power outlet It worked continuously for months.

One day while experimenting, however, Hutchison cracked a crucial part and decided to take the unit apart.

He built a smaller, more portable model to take on his speaking tour. Resembling an Oscar statue in size and shape, the portable converter put out slightly more than a watt of power. It lit a tiny lamp as a demonstration and also ran a small motor.

At the end of the tour, in front of an audience of about 500 Hiroshima residents, Hutchison slapped the device onto a table lit by the bright lights of a television crew. He quickly unscrewed all the parts and revealed its inner details, while the camera zoomed in for a closeup and a pair of chopsticks provided a scale to show the size of the device. It was clear that the converter contained no batteries. Afterward, men crowded around Hutchison, offering him their business cards and asking him to sell them a supply of barium titanate.

Back home, Hutchison's business advisor fretted that the inventor had given away his secrets. But Hutchison shrugged his shoulders; he had gone beyond the prototype technology he had taken to Japan. He now had a new secret - the stovetop process he called Dirt Cheap because the ingredients included common rocks.

The new process grew out of his use of barium titanate. He wondered, "Why can't I make a material that works even better?" Hutchison knew that other researchers had put electrodes on certain rocks to show that the rocks generated a tiny electric current, somehow soaked up from the cosmos.

So Hutchison sorted through small stones on the street in front of his apartment and threw them into a test tube-sized metal container. Next, he added a mixture of low-cost, common chemicals, he won't reveal which ones and put this rock soup on the stove to simmer. This allowed water to evaporate and tiny pockets of air to rise from the stones so that the chemicals could enter them. Before the mixture cooled into a solid, he added specially treated posts to draw electricity from the crystal-like substance th at had formed. Again, no one is entirely sure as to how the Dirt Cheap method works, although one physicist told Hutchison that the Casimir effect, used by Ken Shoulders to create charge clusters, may be at work (see page 61).

When he first discovered his Dirt Cheap process, Hutchison didn't bother to patent it. He had heard from other inventors how their laboratories had been vandalized and their property had been stolen once the Patent Office had been notified, and he was not eager to be the first inventor to take a bold step by manufacturing a large home- or factory-sized unit that could restructure industries. Besides, in the 1980s --- when he was still working with the Hutchison effect --- he had received a few threatening comments from strangers.

How could Hutchison enjoy his peaceful life and still get a space energy product to the public in a low-key manner? He says he has hit upon an unusual strategy: building miniature flying saucers powered by Dirt Cheap-supplied electricity, and selling them as space-energy children's toys. Hutchison hopes an environmentally safe toy that lights up without batteries will intrigue the public into buying Dirt Cheap devices that could power large appliances. And perhaps, the Dirt Cheap process could help lead to a world of nonpolluting new energy.

Source: http://www.guns.connect.fi/innoplaza/energy/story/John/index.html

John Hutchison, The Wild Scientist From Vancouver

(20.08.2001. Update 04.02.2002)

Photo: Dr. John Hutchison in his living room surrounded by a collection of ship instruments. As he has removed furniture and other household items to give room for the multitude of equipment, the feeling is like being inside a submarine.

We spotted John walking on the street in New Westminster, Vancouver. The tall man with absent daydreaming look in the eyes below his characteristic leather helmet was easy to recognize even if never seen him before.

This self educated physicist has practically become one of the living symbols of new energy experimenting. Not without side effects. John has taken some precautions to guard his privacy, with some humorous wink in his intelligent eyes. Right under the CIA decorated door eye was a sign stating:

" **Attention ---** No Government Agents, Federal, Provincial or Municipal Agents of Canada are allowed on these Premises. Those in Violation are subject to prosecution. - - - Exempt news media, USA, Liechtenstein or other countries."

We followed John In...

There was just enough room in the hall for the door to open. When walking sideways we could fit through the narrow space to step over a box between shelves and come into John's apartment.

John has appeared on stage of international TV shows quite a lot of times. He likes to tell about his famous friends like movie stars, millionaires, scientists and government employees. Photos of many of them were fixed beside kitchen door, or what had once been one. Kitchen was loaded with equipment.

"My friends now and then send me few tens of thousands of dollars just to see what comes out with my experiments. Once I even got an Independence Day greeting from the White House. I thought it was a joke until I got one the next year again. In the U.S. free energy is quite a popular topic and big business" , John tells.*"I am supported by my friends who are American and German millionaires. I have sold some of my free energy batteries to Japan. I also know high ranking U.S. officials like John Alexander. I have been demonstrating my effects for the U.S. government several times."*

Photo: John shows light to tell about his famous friends with whom he has been photographed.

Free Energy Battery ---

The version that John showed was made of rhodium plated polarized quartz discs bound together with a long bolt. There are also some different types of discs between. The array has been taped to a rigid spine holding it straight. *"It gives 18 volts and a quarter amp. Tom Bearden instructed me how to do the metal plating on quartz discs."*

Photo: John shows the quartz type battery and some drawings of it, taps the battery for a moment and the red LED starts glowing.

John connects battery leads to a LED. Then he starts tapping, bending and hitting the battery in a way only he masters as the builder of the experimental power source. After a while the battery comes into life and lights the red LED. The LED is connected to the battery without series resistor so the idle voltage stated as 18 volts apparently drops down to the red LED operating voltage of some two volts with load connected. *"I sold a 55 000 volt type made to Japan. It was very well made. The owner is now showing it to audience"*.

Another type of John's batteries is the Electric Crystal which has been baked from natural minerals. *"I like this one - it is so easy to make and the materials are dirt cheap. I have made honeycombs with 1 cc of material in each cell to give more voltage and current. Good ones* that I sold for 35 000 USD gave 3 volts and one amp. I have made prototype for a 55 000 volt battery but it blew up. I have it on video."

Well, what he then intends to do with them? *"Now I would rather get these batteries out of my hands to concentrate on further experiments with the Hutchison Effect"*, he states.

Rotating Ear In Living Room ---

One of the eye-catching apparatus resembles a giant ear. *"It is a direction finding antenna used in ships"*, John tells. *"I can put it rotating. It does not shake although it is heavy. It just vibrates a little"*. John kneels down on the floor to avoid being hit by the circling aerial and accelerates it to a speed of several rounds per second. The feeling is so authentic that we have a desire to run to the ship bridge to check the radio beacon markers from the direction finding screen...

John powers up the rotating direction finding aerial before the balcony door. It works smoothly and quietly. Balcony itself is already reserved for a large sighting device and a ship cannon John has himself built from scrap.

Cold Melted Metals ---

The phrase "Hutchison effect" is used except about John's levitation experiments also about these weird pieces of metal. John tells that the deformations have taken place in room temperature as a result of a complex combination of electromagnetic fields. Left above: Steel. Left below: Aluminum with coin marks and one coin inserted in the partially opened crack. Middle: completely cracked aluminum bar. Right above and below: Aluminum block partially cut open to show a piece of brown material cold melted in. John tells it is wood.

"Getting the effects is like opening an electromagnetic combination lock. I was actually so busy with adjusting the controls that I had no time to observe how the test pieces behaved in the combination of fields." About his levitation and cold melting H-effects John likes to think their origin connected with external dimensions. This explanation is fascinating. Now one may be manipulating with some Interdimensional wormholes within matter and it's basic particles.

Photo: John with examples of his Hutchison Effect test objects.

Afterwards, an alternative way of explaining the cold melting appears in visitor's mind. When exposing the object to a combination of electromagnetic fields with many frequencies simultaneously one actually may be trying to hit as many of the atom's orbital or nuclear resonances as possible.

Now as the atom is busy oscillating by itself and trying to stay in one piece under the strain of excess energy, it has other things to worry about than trying to keep tight bonds with neighboring atoms. While experimenter turns more power and hits more of it's resonances, the outer electrons responsible for metallic bonds start to shake themselves loose from other atoms and they start to slide past each other. The result is a soft, trembling jelly of metal.

After the fields are cut off, the metal pieces of cause calm down after it's momentary nightmare of what appeared like melting in comfortable, cool room temperature. Metallic bonds settle for their familiar firm handshake with neighboring atoms with the resulting deformations John just showed - the Hutchison Effect.

John states that today he co-operates only with some distinguished U.S. scientists like Ken Shoulders. Indeed, when thinking it closely these John's experiments may have something in common with Shoulders' discovery about electron cluster sparks which seem to have some non-heating means of taking matter apart.

By Shoulders, the energy of an electric spark is less than what is required for melting equal amount of substance. So the electron packet or cluster present in sparks is obviously having some alternative means of loosening atomary bonds within matter than heating. Here we have a connection to John's cold melting effects with electromagnetic fields and high voltage. For more information about Shoulders' electron cluster, see his fine description, "Charge Clusters In Action".

"With one levitation experiment the object started to vertically circle around in the air." We tried to explain this due to interference in the field due to slight instrument frequency wobbling or drifting. About possible changes in object inertial mass in his levitation experiments John could not tell.

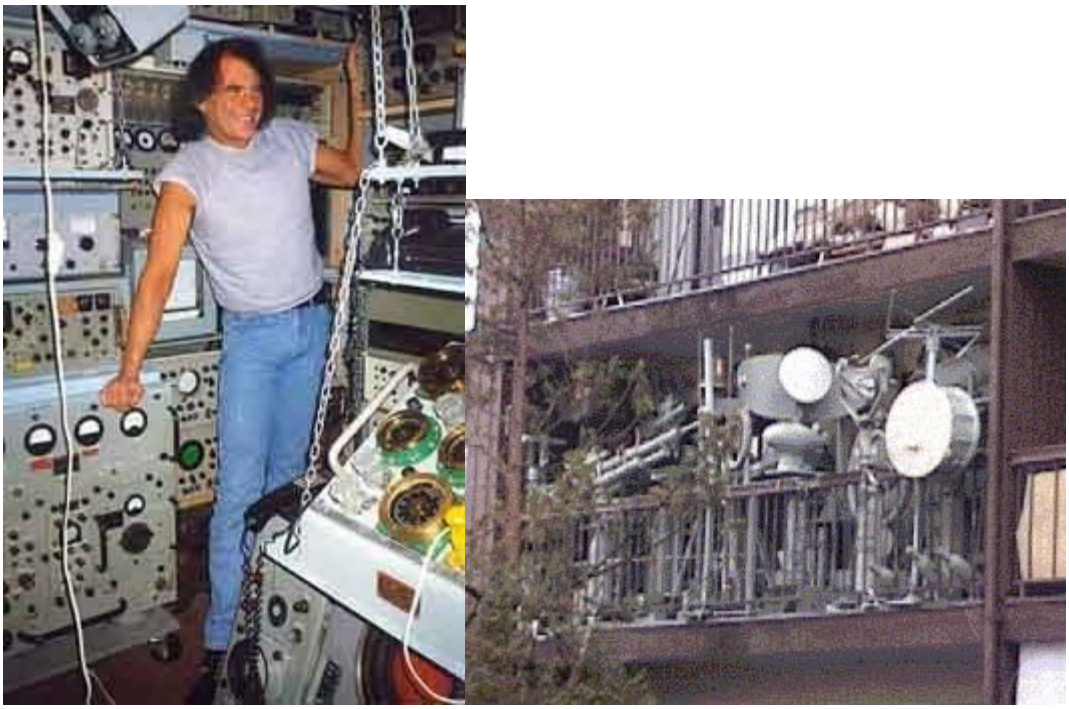
The Character Behind 'Hutchison Effect' ---

If you choose to be a personality, let's be so full ahead. It is easy to stir people and you can imagine ordinary citizen's confusion when landing on the deck of John's apartment. And for sure, John enjoys to observe visitor's reactions...

We also got an impression of a sedate, peaceful man with a very clear train of thoughts and an instant ability to concentrate on any interesting subject. When concentrating on something, everything else in daily schedules is shut out of his mind. He just drifts from a moment to another grasping wholly to each one. When thinking, John is out of our time.

John can also convincingly play fool when needed --- or just for fun --- and he likes doing so. His unique appearance he is intentionally keeping intensifies this another 'Hutchison Effect'. Even if knowing him you may be easily tricked, unless you know the exceptionally smart mind you are dealing with.

SLOW
HALF
FULL
AHEAD
STOP
SLOW
HALF
FULL
ASTERN
ENGINE ROOM
TELEGRAPH



Successful Replication of The Hutchison Effect
by

Mark Solis & John Hutchison

(October 10, 1998)

Two important aspects of the Hutchison Effect have been confirmed independently by scientific researchers Richard Hull and Ken Shoulders.

Historical investigations by Richard Hull of the early development of the Farnsworth Fusion Machine have uncovered independent confirmations by several of the researchers on the project that solid metal portions of the apparatus became transparent on a number of occaisions. In one such case, the red plasma filaments were visible through the ion guns, giving the impression that the ion beams were standing in mid-air, as if physically outside the system, though they were not.

Spontaneous invisibility of materials in the "active zone" of a Pharos-type Hutchison apparatus is also a characteristic of the Hutchison effect.

These events regarding the Farnsworth Fusor were reported in Electric Spacecraft Journal.

Physicist Ken Shoulders, who has an excellent reputation as a theoretician and experimenter, has successfully replicated the anomalous localized heating effects of the Hutchison Effect. These effects often involve the spontaneous breakage of metals under what appears to be extreme thermal stress, and yet there is no evidence of the presence of heat in adjoining materials, where under normal circumstances one would expect scorching or carbon scoring, at the very least.

Moreover, Ken Shoulders has succeeded in proposing a viable theoretical explanation for these effects, and is now working to fully confirm the theory.

Source: http://www.geocities.com/ResearchTriangle/Thinktank/8863/index.html#UPDATE (18 March 2000)

John Hutchison Raided At Gunpoint By Canadian Police

Word has been received this morning, Saturday, 18 March 2000, that John Hutchison has been raided at gunpoint by Canadian Police.

John's apartment in New Westminster, British Columbia, was raided at 2 PM Friday, 17 March 2000, by gun-wielding police searching for firearms. An antique gun collection owned by Hutchison was confiscated in its entirety.

According to Hutchison, a phone call was received at about 2 PM Friday, stating that it was the police, and asking John to answer his door. Hutchison states that there were 8 to 10 individuals pointing weapons at him, only two or three of whom were in uniform. The rest were dressed in dark clothing.

Hutchison was handcuffed and placed on the outside steps while police searched the apartment. No warrant was claimed or shown at any time. Police stated only that there had been an anonymous complaint that firearms were being brought into the apartment.

Police also called in an "electrical inspector" to examine John's lab equipment. This is the famous "Hutchison apparatus" with which John produces the renowned "Hutchison Effect."

Additional individuals dressed in suits were brought in who took extensive photographs of the Hutchison apparatus. Hutchison indicates that these persons had an "official air" about them, and that they might be Government agents, especially given the confiscation of the original Hutchison lab, which took place while John was out of the country in 1990. None of these persons showed any identification.

Those who have followed John's career of invention and innovation will recall that his first laboratory was forcibly seized by the Canadian Government on 24 February 1990 by the direct order of former Canadian Prime Minister Brian Mulroney. The Government has retained the lab in spite of a court order by Judge Paris of the Supreme Court of British Columbia to return it.

A previous raid on John Hutchison's apartment involving his collection of antique firearms occured in 1978, and processing took two years. The confiscated antiques were returned at the order of Judge Cronin. These events occurred under the administration of former PM Pierre Trudeau. Former PM Joe Clark, who took over in the 1980s following the Trudeau administration, wrote to Hutchison offering help and support.

The present raid follows close on the heels of a recent successful levitation performed 11 October 1999 which was videotaped by John. The effect was achieved after six days worth of attempts.

However, neighbors called local police to complain about Hutchison's experiment. It is unclear whether something in their apartment levitated, although there is no other way known at this time that they could have been aware of the levitation experiment that was in progress. The neighbors in question live across the street from Hutchison. The sound of approaching sirens

was recorded on the video soundtrack of Hutchison's camcorder during the experiment, and video of some emergency vehicles and personnel was obtained.

Further updates on the situation will be posted promptly on this website.

Mark A. Solis (Shreveport, LA, USA) -- Webmaster for John Hutchison

Sandy KIDD Gyroscopic Propulsion

http://newilluminati.blog-city.com/antigravity_machine.htm

Anti-Gravity Machine

Wheels Within Wheels

"Scientists will simply have to accept that I am right and physics is wrong," according to Scots engineer Sandy Kidd. "Only then can we open up the universe and take man to mars in just a few hours longer than the present flying time between Sydney and London."

These outlandish -- even unearthly -- claims would normally be dismissed out of hand; but not when they come from Sandy Kidd. His invention, the Kidd Machine, shouldn't work -- but it does, repeatedly.

Sandy Kidd set out to create an anti-gravity machine in 1980, a device which could one day power flying saucers with energy derived from high-speed gyroscopes. While working as a planning engineer with a North Sea oil company for four years, he spent nearly every spare minute in a makeshift workshop in his garden shed in Dundee, Scotland. Then, at Christmas in 1984, his machine generated its first vertical thrust. "Not much, but it was there and I was over the moon," he recalls. A few weeks later the device was demonstrated at Imperial College, London, for Professor Eric Laithwaite, a pioneering expert on gyroscopes.

After watching the three kilogram, 45-centimetre unit with a gyroscope at each end of a crossarm rise from the test-bench against a counter-weight, he described Kidd as "ingenious'.

"What we have here is a potential space drive," Laithwaite said. "Properly developed, this would take you to the outer universe on a spoonful of uranium."

Two years later, research physicist Dr Bill Ferrier of Dundee university examined the device on campus. "Its potential is mind-boggling," Ferrier announced. After Sandy Kidd moved to

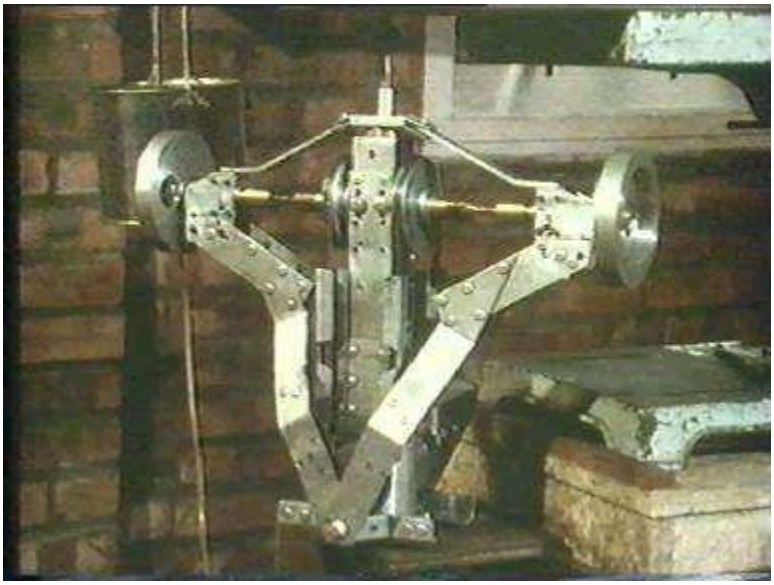
Australia a second prototype was tested in Melbourne for three days under the supervision of specialist engineers. Placed in a sealed wooden box, it was suspended from a cord attached to an overhead beam fitted with sensitive measuring instruments. Powered by a model aircraft engine, the entire device lost weight as the vertical thrust overcame the 'force' of gravity.

"It created enough thrust to float a small orange through the middle of a room," said Kidd. "People in the laboratory were clearly shaken."

The Kidd Machine produces lift without reacting on air, water or a solid surface and therefore appears to be defying Newton's Third Law of Motion that states that every action must have an equal and opposite reaction.

"What Kidd has achieved will certainly shake the scientific world to the core when they realize the implications of the results," announced prematurely optimistic astrophysicist Dr Harold Aspden of Southampton University in the 1980s. "It should now be possible to build a machine big enough to lift itself off the ground with a full payload."

Mr Kidd was working under contract to BWN, an Australian-based company. BWN refused to divulge laboratory details despite wide mainstream media disclosure, including demonstrations on a number of TV programs. "Full public disclosure would simply encourage others to build similar devices and perhaps overtake us," said Noel Carrol of BWN. "Industrial espionage is another risk we face." Work to increase lift and design a commercial prototype "may take several years but we'll get there," said Kidd in 1988.



http://www.gyroscopes.org/propulsion.asp

Sandy Kidd and Force Precessed Gyroscopes

A simplified description of force precessed gyroscopes

In the following set of diagrams red arrows are used to show the force applied to the structure. Provided the gyroscopes themselves are rotating in the correct direction (not shown on diagram) the gyroscopes will produce a counter-acting force known as precession, as shown in the diagram as two blue arrows.

Normally this would produce a continuous torque as the whole device is revolving which would cancel it self out in the form of stress in the structure of the machine. However in Sandy's patent the gyroscopes are pushed in/out using cams resulting in the following motion (represented by the eight diagrams). As far as I can understand a number of up-ward pulses are produced due to the two gyroscopes (in this particular case, more can be used) exerting a force towards the centre of the structure (axle). This in effect is a vastly simplified version of what is going on. A number of independent tests have shown results for and against the machine.

While working in the Air Force, Dundee based engineer Sandy Kidd was one day taking a gyroscope out of an aircraft. Not realising that the gyroscope was still running, he came down the steps of the aircraft and turned at the base of the steps. At this point the gyroscope almost threw him across the floor. This stirred his interest in gyroscopes, Sandy spent many years and tens of thousands of pounds in his garden-shed/garage developing and working on gyroscopic devices. Trying to get a number of gyroscopes to react against one another to produce lift. In time he developed a device that he claimed could achieve this. Building other models using that principle and discussing his ideas with others, he came to conclusions of how it worked. Dundee University was interested in the invention and for a time worked with him, but long term could not supply the funds or enthusiasm that was needed. He tried obtaining funds to develop his invention in Scotland, but had to resort to looking for funds elsewhere. An Australia corporation BWM took the task on to develop a gyroscopic propulsion system but unfortunately the company went bust. British Aerospace has also been involved in the research with him but dropped the funding.

A UK/European patent for his invention was applied for (I have a copy of the application). I did try to find a granted patent for Europe but without success. I ended up phoning the European patent office to find out if one was granted. I was told that it would have been, but it was withdrawn at the last moment (funding dropped). I did however find a granted US patent (5024112). The fees for the patent have stopped being paid for some years ago. Which means anyone is free to copy, sell etc his invention (At least in the US/Europe).

Sandy is still working on various devices based around gyroscopes and hopefully we will be seeing more inventive designs from him in the near future.

Dr Bill Ferrier of Dundee University talking about Sandy Kidd's machine in 1986:

".....There is no doubt that the machine does produce vertical lift. Several modifications were then made at my suggestions in order to disprove other possibilities of lift, particularly aerodynamic effects.

I am fully satisfied that this device needs further research and development. I have expressed

myself willing to help Mr Kidd whose engineering ability is beyond question, and for whom I now have the greatest respect. I am currently trying to interest the university in housing the development and also in finding 'enterprise' money to fund the next stage.

I do not as yet understand why this device works. But it does work! The importance of this is probably obvious to the reader but, if it is not, let me just say that the technological possibilities of such a device are enormous. Its commercial exploitation must be worth millions."

USP 5024112

Gyroscopic apparatus

Publication date: 1991-06-18
Inventor(s): KIDD ALEXANDER D [GB] + (KIDD, ALEXANDER D)
Applicant(s): CARROLL NOEL [AU] + (CARROLL, NOEL)
Classification: - international: F03G3/00; F03G3/08; F03H99/00; G01C19/02; F03G3/00; F03H99/00; G01C19/00; (IPC1-7): F16H27/04; G01C19/06 ;- European: F03G3/08; G01C19/02

Also published as: WO8804364 // EP0335895 // EP0335895 // BR8707912 // AU595089

Abstract

A gyroscopic apparatus (100), having application as a prime mover, comprises a pair of discs (102) disposed opposite one another with arms (104) rotatably supporting the discs (102) connected at a pivot point, the pivot axis thereof lying in a plane midway between the discs (102). A drive arrangement (124, 126, 180) operates to spin the discs (102) in opposite directions while simultaneously rotating the whole assembly of discs (102) and arms (104) about a second axis in the same plane as, but perpendicular to, the pivot axis. A camming arrangement (144, 146, 152) working in conjunction with the rotation about the second axis periodically forces the spinning discs (102) to pivot about the pivot axis to thereby generate a force along the second axis which can be used to perform useful work.

Description

The present invention relates to a gyroscopic apparatus particularly, but not exclusively, for providing a source of energy. More particularly, the present invention relates to a gyroscopic apparatus having application as a prime mover on land, water or in space.

A gyroscope can, in its broadest aspect, be considered as an object rotating about a fixed point, and for practical purposes a gyroscope consists of an axially symmetrical rotating body. A significant feature of a gyroscope is that the angular momentum and the rotational axis preserve their direction as long as no external forces act upon the gyroscope, and because of these tendencies the gyroscope is often used as a movement stabiliser. To increase the rotational momentum the gyroscope is generally constructed with its mass as far as possible from the axis of rotation. This can be readily achieved using a disc with a thickened rim.

As the gyroscope precesses about its axis a considerable amount of energy is stored in the device by virtue of its rotating mass. However, conversion of this energy to useful work is poorly documented. Release of this energy along the precession of rotation axis as the device rotates would generate a thrust which could have many diverse applications.

When angular velocity changes direction but constant in magnitude, the angular acceleration is known as gyropscopic acceleration and the couple which produces the acceleration is known as a gyroscopic couple. In the case of a disc rotating about in a vertical plane about a horizontal axis with angular velocity .omega., which is at the same time spinning about a spin axis, a gyroscopic couple is created which is orthogonal to the plane of precession and the plane of rotation. The sense of the gyroscopic couple depends on the direction of rotation of the disc and of the precession axis.

An object of the present invention is to provide a gyroscopic apparatus which is capable of generating a pulsatile force.

In accordance with the present invention there is provided a gyroscopic apparatus comprising:

a pair of rotatable masses disposed opposite one another;

means for mounting said masses which enable said masses to pivot about a pivot axis, said pivot axis lying in a mirror image plane which is directly between said masses;

drive means for driving said masses so as to give said masses respective opposite angular momentums, having directions substantially perpendicular to and directed away from said plane, and for driving said apparatus so as to rotate said masses about a central axis which is in said plane and perpendicular to said pivot axis;

means for periodically forcing said masses towards one another from a predetermined position and allowing said masses to return to said predetermined position so as to generate a pulsatile force in said mounting means.

Accordingly, in one aspect of the present invention there is provided a gyroscopic apparatus comprising:

a first shaft adapted to be rotated about a precession axis,

at least two second shafts generally disposed orthogonally to said first shaft and coupled to said first and each second shaft having an end carrying a rotatable mass thereon, said masses being substantially diametrically disposed and being rotatable in different directions about a respective shaft axis,

drive means adapted to rotate said orthogonal second shafts and said rotatable masses as said apparatus spins about said precession axis,

mass support means coupled between said first shaft and each orthogonal shaft for supporting each mass during rotation of said gyroscopic thrust apparatus about said precession axis,

mass reciprocating means coupled between said first shaft and said mass support means for causing said masses to reciprocate in rectilinear movement as said masses rotate about said precession axis, and

thrust bearing means disposed on said first shaft at an upper end thereof for transmitting thrust axially along said first axis, the arrangement being such that, in use, said gyroscopic thrust apparatus is rotated about said precession axis and said masses are rotated about each respective shaft axis and are also reciprocated in a direction substantially orthogonal to said precession axis, and as the speed of rotation reaches a predetermined value, pulsatile force is created which acts through said mass support means to create an upward thrust on said first shaft which transmits said upward thrust to said thrust bearing.

Preferred embodiments of the present invention will hereinafter be described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a perspective view of a first preferred embodiment of a gyroscopic apparatus according to the present invention;

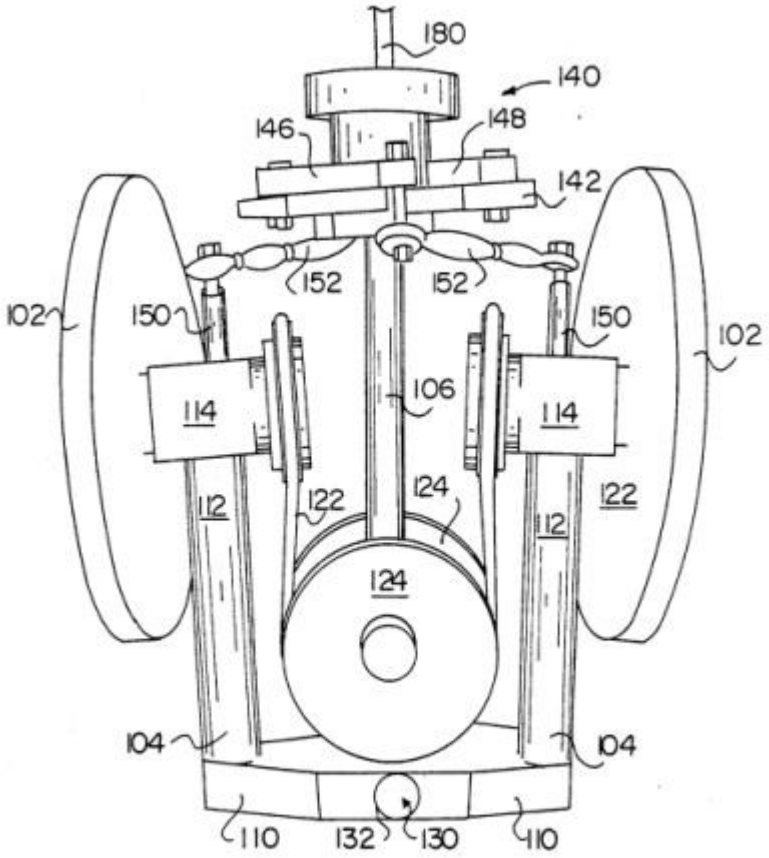


FIG. 1

FIG. 2 is a top perspective view of the gyroscopic apparatus of FIG. 1;

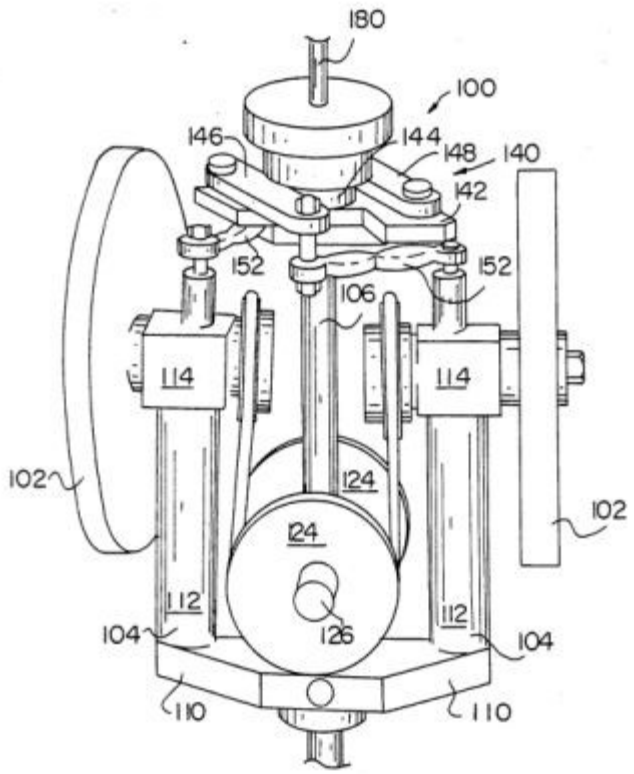


FIG. 2

FIG. 3 is a side view of the apparatus of FIG. 1;

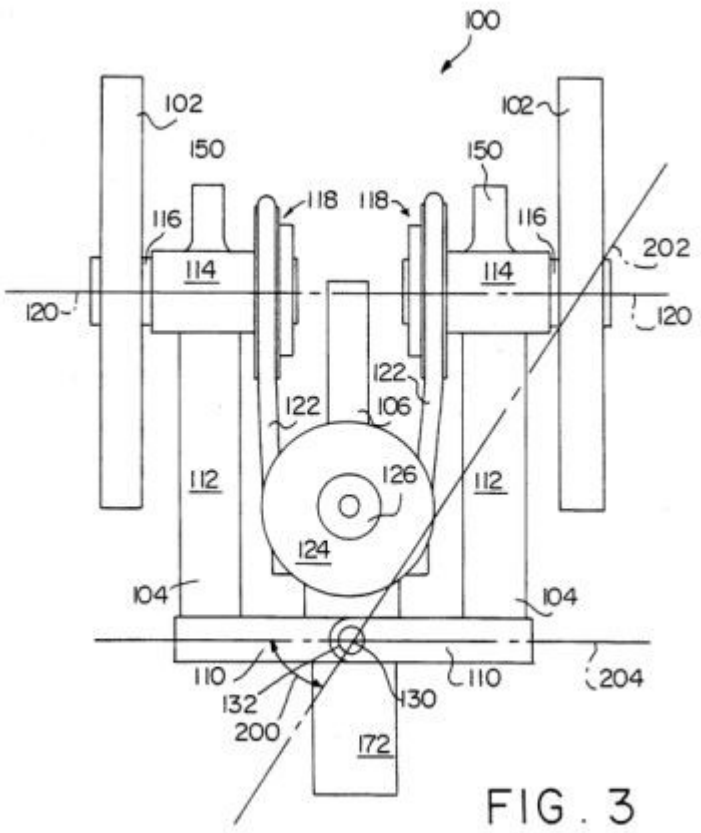


FIG. 3

FIG. 4 is an end view of the apparatus of FIG. 1;

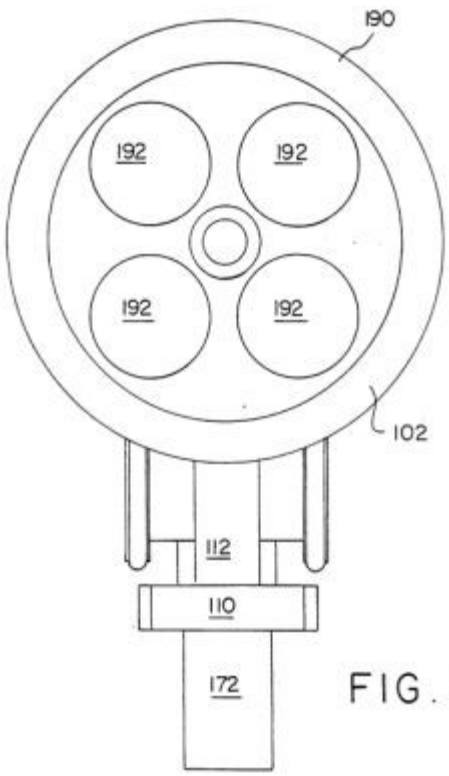


FIG. 4

FIG. 5 is a perspective view of a drive coupling mechanism of the apparatus of FIG. 1;

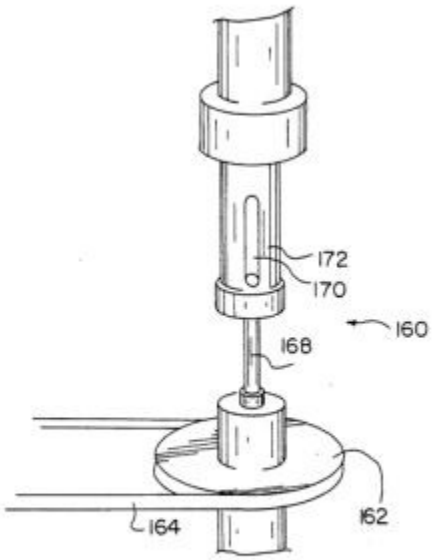


FIG. 5

FIG. 6 is a side view of a second preferred embodiment of a gyroscopic thrust apparatus in accordance with the present invention;

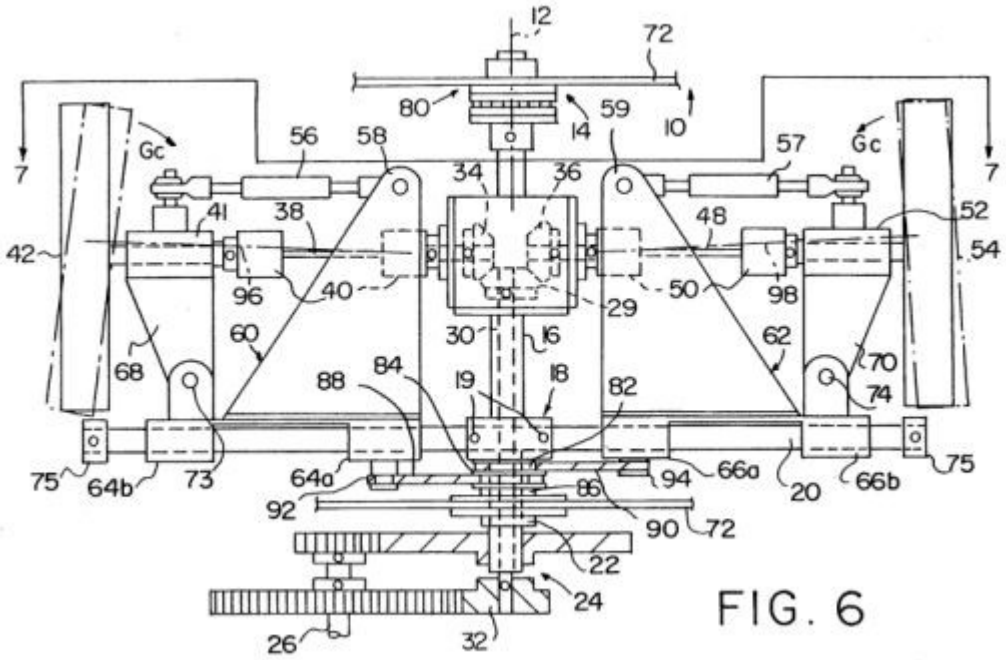


FIG. 6

FIG. 7 is a sectional view 7--7 of the apparatus of FIG. 6; and

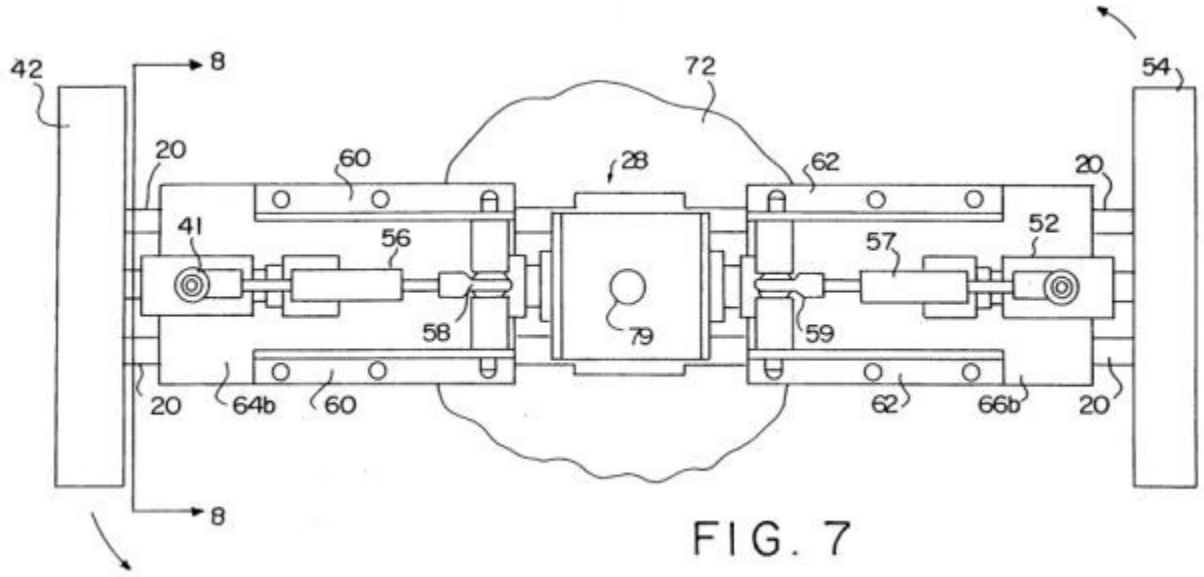


FIG. 7

FIG. 8 is a sectional view 8--8 of the apparatus as shown in FIG. 7.

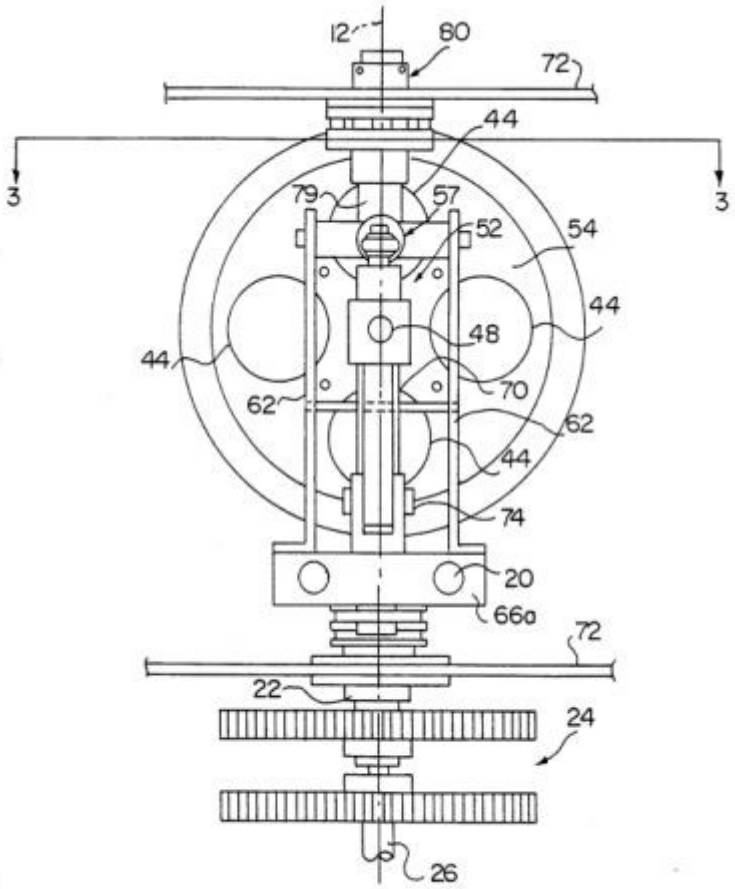


FIG. 8

A gyroscopic thrust apparatus 100, as shown in FIGS. 1 to 4, comprises a pair of opposed identical rotatable discs 102, two respective arms 104 used to mount and support the discs 102 and a central rotatable shaft 106. The arms 104 are "L" shaped and each has a base portion 110 and an upwardly extending column portion 112. At the top of each column portion 112 there is disposed a shaft mounting block 114 which is adapted to receive a rotatable shaft 116. Both ends of the rotatable shafts 116 extend from their respective mounting blocks 114, with one end being fixed to the centre of a respective disc 102 and the other end being fixed to a respective pulley wheel 118.

The discs 102 are driven by the pulley wheels 118 so as to give discs 102 an angular momentum L along the axis of rotation 120 of the discs 102 and directed away from the central shaft 106. The pulley wheels 118 are driven by a flexible cable 122, which in turn is driven by a pair of coaxial driving wheels 124. The axis of the driving wheels 124 is perpendicular to the axis 120 of the coaxial pulley wheels 118. The driving 124 wheels are driven by a shaft 126 which is coupled to a driving mechanism, described below with reference to FIG. 5.

The arms 104 are pivotal about a pivot axis 130 at which the bases are hinged and connected to a coupling pin 132. The positioning of the arms 104 is controlled by a linkage arrangement 140, illustrated in FIGS. 1 and 2. The linkage arrangement 140 comprises a plate 142 adapted for rotation about the axis of the central shaft 106 with respect to a cam 144. Two link arms 146 and 148 are disposed opposite one another and adjacent the cam 144. Each link arm 144 and 146 is fixed to the plate 142 at one end thereof so that end is only able to pivot in a horizontal plane parallel to the plane of the plate 142. A side surface of the each link arm 146 and 148 abuts the cam 144 so that on rotation of the plate 142 with respect to the cam 144 the free ends of the link arms 146 and 148 are pivoted with respect to their fixed ends by virtue of the action of the cam 144. The arms 104 of the discs 102 include a coupling portion 150 fixed to the top of each mounting block 114 and the coupling portions 150 are coupled respectively to the free ends of the link arms 146 and 148 by lost motion links 152.

The driving wheels 124 are driven by a first driving mechanism 160, as illustrated in FIG. 5, which comprises a pulley wheel 162, that is driven by a drive belt 164 and has a drive shaft 168 extending therefrom. The drive shaft 168 is keyed to a slot 170 of a shaft 172 which is coupled to the shaft 126 of the driving wheels 124 by a bearing mechanism (not shown). The keyed coupling of the drive shaft 168 to the upper shaft 172 enables the gyroscopic apparatus 100 to move vertically with respect to the drive shaft 168 and the pulley 162. The vertical movement of the apparatus 100 is also facilitated by providing an inner shaft 180 which extends within the central shaft 106 such that the central shaft 106 and the apparatus 100 is slideable with respect to the inner shaft 180. The inner shaft 180 is also used to drive the apparatus 100 so as to rotate the arms 104 and the disc 102 about the axis of the central shaft 106 so as to impart a torque T directed upwards along the axis of the inner shaft 180, on the discs 102.

The discs 102, as shown in FIG. 4, are constructed so that most of their mass is concentrated on the rims 190 of the discs 102. This concentration is assisted by providing holes 192 in the discs 102 between their axis of rotation 120 and the rims 190. This gives the discs 102 a larger component of angular momentum for a given angular velocity.

The apparatus 100 is driven so as to impart an angular momentum, as discussed previously, on each of the discs 102 and at the same time rotate the apparatus 100 about the inner shaft 180. Whilst the apparatus 100 rotates the cam 144 is held fixed by a locking mechanism (not shown) so that the linkage arrangement 140 periodically pulls the discs 102 in towards one another.

As the discs 102 are rotated about the axis 120, the torque applied on the inner shaft 180 ensures that a torque is applied to the discs 102 which is perpendicular to their angular momentum and directed upwards. This torque causes a gyroscopic couple to be applied to the discs 102 by virtue of the relationship between torque and change in angular momentum, as stipulated in equation 1 below.

The applied torque causes the angular momentum of the discs 102 to change direction and move upwards, in other words causes the discs 102 to precess upwards. The discs 102, however, are also being acted upon at the same time by a centrifugal force, which is acting to move the discs 102 down to the position where their axes are aligned, as shown in FIG. 3. Utilising the action of both the gyroscopic couple and the centrifugal force, the apparatus 100 is driven so that the discs are positioned to form an angle 200, as shown in FIG. 3. The angle 200 is the angle between the plane 202, which includes the pivot axis 130 and the centre of a disc 102, and the plane 204

which is perpendicular to the applied torque. For the apparatus 100 to operate effectively the discs 102 should be positioned so that in use the angle 200 is greater is than 45.degree.. When this occurs and the linkage arrangement 140, together with the cam 144, is used to periodically pull the discs 102 in towards one another, the centrifugal force acting on the discs 102 causes the discs 102 to move away from one another whenever the cam 144 is not acting to bring them together. The cam 144 and the linkage arrangement 140 are designed so that the discs 102, as they are rotating about the axis central shaft 106, move towards and away from each other with relatively high frequency. The discs 102 are moved in this manner so as to decrease and increase their component of angular momentum which is directed along the central axis of the shaft 106. The angular momentum of the discs 102 is changed in such a manner so as to produce a higher rate of change in one direction than in another so as to produce a torque which gives rise to an upward force in the column portions 112 of the arms 104 of the discs 102. This is preferably achieved by configuring the surface of the cam 144 so the discs 102 are moved in towards each other at a faster rate, by the action of the cam 144 and the linkage arrangement 140 than the rate at which they recover and move away from one another under the action of the centrifugal force. An alternative method involves moving one disc 102 in towards and away from the central axis 106 at one rate whilst the other disc 102 is moved in towards and away from the central shaft 106 at a slower rate. The first is achieved using a symmetrical cam 144 and the second is achieved using an asymmetrical cam 144.

The differing rates of change in angular momentum and different directions in which the changes take place result in a pulsatile force which appears in the arms 104 and causes the apparatus 100 to periodically move up and down along the inner shaft 180. Whilst the force is pulsatile and gives the apparatus 100 a vibrating motion, over a period of time, due to the differing rates of change in angular momentum, a net upward force is generated in the arms 104 of the discs 102 which may be put towards useful work.

A second preferred embodiment of a gyroscopic apparatus, is illustrated in FIGS. 6 to 8 and generally indicated by reference numeral 10. The apparatus 10 is adapted to be rotated about a vertical spin or precession axis 12 so that gyroscopic couples result in an upwardly directed force onto thrust bearing 14 as will be later described in detail, and which can be used to provide work.

The gyroscopic apparatus 10 has a central shaft 16 coaxial with axis 12 which is coupled by a bracket 18 and fixing pins 19 at its lower end to a twin shafted slide unit 20. The slide unit 20 is mounted on a bottom support bearing 22 and is coupled to a gearbox drive arrangement, generally indicated by reference numeral 24 which has gears and an input power shaft 26 to which an input power source, not shown in the interest of clarity, can be connected. The entire apparatus 10 can be rotated about precession axis via gearbox drive 24.

The upper end of the shaft 16 is coupled to a miter gear 29 seen in broken outline within a gearbox 28. Within shaft 16 is a gyroscopic drive shaft 30, seen in broken outline, which is also driven by gearbox drive 24 and which terminates in gear 32. Coupled to gear 29 are gears 34, 36 which are adapted to be rotated in opposite directions. Coupled to gear 34 is a shaft 38 connected by universal joints 40 and bearing housing 41 to a gyroscope 42 in the form of a planar disc with four holes 44 equiangularly spaced about its circumference, as best seen in FIG. 2. The rim 46 of the disc is thickened to increase rotational momentum as aforedescribed. Gear 36 is coupled via shaft 48, universal joints 50 and bearing housing 52 to gyroscope 54 which are identical to the aforedescribed components.

Each bearing housing 41, 52 is coupled by adjustable lost motion links 56, 57 to yokes 58, 59 mounted at the top of twin brackets 60, 62. At the bottom of each bracket 60, 62 spaced guides 64a, b, 66a, b are disposed which allow the brackets to slide on respective twin slides 20 as will be described. The links 56, 57 have adjustable free-play built in to permit the gyroscopes 42, 54 to move towards the centre axis 12 as the apparatus rotates. Also, each bearing housing 41, 50 is coupled to a gyroscope housing bearing support arms 68, 70 which in turn is connected via loose stud pivotal joints 73, 74 to respective bearing support arms 60, 62 in proximity to outermost guides 64b, 66b. The slide 20 terminates in keeper plates 75 to prevent the brackets coming off the slide. Thus bearing support arms 60, 62 can pivot relative to joints 73, 74 so that bearing housings 41, 52 and hence gyros 42, 54 can move relative to their respective stop links 56, 57.

At the top of the unit the shaft 79 terminates in an upper support bearing 80 which, together with bearing 22, permits the unit 10 to be rotated about axis 12. The unit can be located in a housing 72 which is partly shown, and which can, of course, be coupled to the drive unit and device to which work is to be applied.

Disposed beneath slide 20 is a pair of opposed eccentrics 82, 84 mounted next to each other on shaft 16. The eccentrics have a support bush 86 bolted thereto and respective connecting rods 88, 90 which are connected to brackets 60, 62 via coupling pins 92, 94. It will be appreciated that as the shaft 16 is rotated bush 86 and eccentrics 82, 84 transform the rotary motion to rectilinear motion which causes the brackets 60, 62 to reciprocate on the slide 20 in opposite senses by the same amount of magnitude.

The gyroscopic apparatus 10 operates as follows:

power into the gearbox 24 causes the whole unit to rotate, for convenience in the anti-clockwise direction of the arrow in FIG. 7. Simultaneously, the drive is supplied via shafts 30, 38, 48, and joints 40, 50 to gyroscopes 42, 54 which are then rotated in opposite directions about horizontal axis 51. In addition, as the unit rotates the eccentrics 82, 84 cause brackets 60, 62 and hence gyroscopes to move reciprocally along slide 20 in opposite senses. That is the gyroscopes moves towards and away from each other in phase once per revolution and this can be considered as "pulsing" movement. Lost motion links 56, 57 and arms 60, 62 initially support the gyroscopes 42, 59 until the precession or spin speed is such that the centripetal force is sufficiently high to support the weight of the gyroscopes. As the rotational speed increases and the speed of gyroscopic rotation increases, a gyroscopic couple shown by arrows, Gc, is created for each gyroscope which, at a certain speed, rises or causes the gyroscopes to tilt upwards to be driven along new axis 96, 98 shown in dotted outline. This movement is permitted because of the freeplay in the lost motion couplings 56, 57 and because of pivotable connection 73, 74. This in combination with the pulsatile movement of the gyros 52, 54 causes a net transfer of energy from the gyros providing a pulsatile upward force acting at each joint 73, 74 which is coupled via slide 20 to shaft 16 and through gearbox 28 and shaft 79 to the lower thrust plate 15 of the thrust bearing 14. When the pulsatile frequency becomes high enough the net force appears substantially continuous and pulse-free. The thrust is transmitted through the thrust bearing to a work destination, such as vehicle drive. The reaction to the thrust is of course created by the vehicle drive.

Various modification may be made to the apparatuses hereinbefore described without departing

from the scope of the invention. For example, the masses may be other than rotatable discs and two or more discs may be present. Preferably, there may be an even number of such discs and two or more shafts can be provided. Also, the discs can be rotated in the opposite direction or the unit can be driven to the opposite direction or the unit can be driven to precess in the opposite direction.

The apparatus has application in many fields, such as lifting apparatus. It is envisaged that the invention has application on land, in or under water and in space. It is believed to be particularly advantageous in space where the force of gravity and friction is minimal. The invention may also have application as a controlled force generator which is proportional to speed of rotation.

Advantages of the invention are that a controlled thrust is provided using a gyroscope which can be used in a variety of work applications. The apparatus requires no special components or materials and can readily be constructed to be drive from a variety of input sources, for example, electric motor, I.C. engine or gas turbine. Because the thrust is derived from gyroscopes the device is believed inherently stable as in the work receiving device.

---

http://keelynet.com/interact/archive/00000604.htm

Sandy Kidd Gyroscopic Levitator

28 Jul 1999

Years ago, we got a letter from Beyond 2000 wanting a set of the KeelyNet disks. The letter said of the information posted that Beyond 2000 had seen, there was more than enough for 2 years of fascinating TV reports and they wanted a set of all the files. They read the file called KIDD1.ASC and wrote back saying they were going to interview Sandy Kidd and broadcast the segment. I got a videotape of the broadcast which is the same one that Discover replayed as shown in this file.

At the time, I believe the conclusion was that the lifting effect was caused by linear friction where the bucket of scrap metal that was used to counterbalance the device was ratcheting downwards due to the unstable rotation of the device causing it to jerk upwards.

Kind of a creeping effect from the successive jerks, analogous to a kinemassic/inertial drive but not exactly the same thing.

This could be tested with an encoder or rpm wheel driven by the rope as it would show a jerking motion as opposed to a smooth transport and pin down the cause of the lift. You will note it goes so high and then stops and Kidd has to start it in the first place, much like engaging the first tooth of a gear though in this case it is release tension so the jerking effect will take over and provide apparent 'lift'.

It is a neat effect at any rate though needs a lot more testing before claiming weight loss or any kind of gravity reduction.

Jerry W. Decker / KeelyNet

Cornwall RO &ltR.O.Cornwall@city.ac.uk wrote:
Hi Stefan and All,

Okay, we will tell you the science of what Tony and I are getting up to &ltNot the nitty gritty). I did some analysis of his setup and applied Newtonian Mechanics. The analysis I show you here is for a near zero reactive propulsion system. Newton's Law seems to contadict itself. The URL is http://www.city.ac.uk/~remi/gyros/CompMass.htm

No, Sandy Kidd is not nutballs. I've seen Tony's system working. To quote Sir Arthur Eddington and bring him up to date and less arrogant:

'Don't believe any slight effect until you have theory BUT do believe any effect if massive and theory can't explain it.'

(He said don't believe any experiment until you have theory). - Remi.

On Wed, 28 Jul 1999,
Stefan Hartmann wrote:

Hi All,

I got a new movie in RealVideo(G2)-format from "Kai Hackemesser" (ltkaha@gmx.de) about the Sandy Kidd Gyroscopic levitator device. It defies the 3rd Newton action-reaction law.

It can be seen at: http://mars.spaceports.com/~over/movies/kiddgyro.ram in streaming mode, otherwise you can also download it at:

http://mars.spaceports.com/~over/movies/kiddgyro.rm

or from:

http://www.wal3.de/temp/Kreiselmaschine.rm

Regards, Stefan.

Videos --

http://il.youtube.com/watch?v=8d9eOGuKukg

http://il.youtube.com/watch?v=_kcRawrslhc&feature=related

http://il.youtube.com/watch?v=8d9eOGuKukg&feature=related

http://www.gyro-scope.co.uk/kiddmov.htm

(kiddmov.gif

---

http://www.zoklet.net/totse/en/fringe/gravity_anti_gravity/gravity5.html

Gyroscopic Propulsion

by

Michael Shanahan

SUNDAY EXPRESS, London, England
Oct. 23, 1988

Garden-shed genius heads for the stars

Day trips to Australia and weekend jaunts in the Milky way could become a reality, thanks to the brainpower of Scottish inventor.

Sandy Kidd's discovery, which is set to revolutionize travel, is already sending shock waves through the scientific establishment. One of Britain's top physicists described it "mind boggling."

Mr. Kidd's work, researched in his garden shed, will make science fiction writers dreams come true. Trips to Mars will take 34 hours and the journey from London to Sydney will be reduced to a matter of minutes.

The 51-year-old former apprentice toolmaker's development of a Gyroscopic Propulsion process has stunned academics because it challenges Isaac Newton's Law of Motion.

He has worked out that, by setting gyroscopes at particular angles, a lifting force that defies gravity is produced.

Mr. Kidd, who worked for five years on his brainchild at his Dundee home, is now moving to the heart of the space industry in California where a massive investment program is already underway.

Dr. Harold Aspden senior visiting research fellow at Southampton University, has seen the results of early tests. "Scientifically speaking it is a bombshell," he says. I would not have believed this if I had not seen it with my own eyes.

"It will totally revolutionize the travel industry. Taken to the ultimate, we will have planes without jet engines and helicopters without rotor blades."

Mr. Kidd is being financed by an Australian research company. A spokesman said: "We are on to something really big. The next stage is to power up Sandy's device in California with the prospect of building a full-scale vehicle at the end of the day. "Money is no object, but we are

determined that his work will get out."

At Imperial College, London, Professor Eric laithwaite, who has followed Mr. Kidd's experiments, said: "I have always been convinced it could be done . . . and I like to see someone defeat the system. He may be a long time perfecting it but I sure he will succeed."

Mr. Kidd made the final breakthrough in this work highlighted in the Sunday Express last year, about four weeks ago in a Laboratory in Melbourne.

"There was just one thing I couldn't understand," said the former RAF radar technician. "I had worked round the problem until that day when it dawned on me.

IF I COULD FIGURE IT OUT WHY HASN'T SOMEBODY ELSE?"

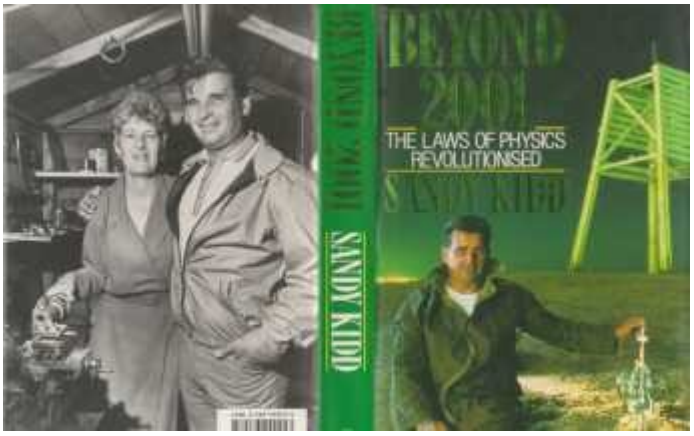
---

http://www.amazon.co.uk/Beyond-2001-Laws-Physics-Revolutionised/dp/028399925X

Beyond 2001: The Laws of Physics Revolutionised

by

Sandy Kidd (Author), Ron Thompson (Author)



Product details

Hardcover: 224 pages
Publisher: Sidgwick & Jackson; 1st edition (Aug 1990)
ISBN-10: 028399925X
ISBN-13: 978-0283999253

Synopsis -- Working from a garden shed in his back garden in Dundee, Scottish amateur Sandy Kidd devised a machine which defies Newton's third law of physics and which could revolutionize space travel. Scorned by the British scientific establishment, he had to take his machine - the gyroscope - to Australia and the USA to get the funding to develop his invention,

which could make possible weekend trips to Mars. This personal account of the former RAF radar technician tells of his struggles, disappointments and triumphs.

---

www.keelynet.com

<keelynet@ix.netcom.com>
21 Jul 1995
From: "duca@swcp.com" <David.A.Duca@swcp.com>
To: keelynet@ix.netcom.com

gravity5.asc

Greetings,

On Mr. Kidd's paper the device is also known as the Mark III A/G thrust unit.

I too had built a "short lived" prototype in the Autumn of '79 of a precessional torque thrust module that certainly produced a desired and complete force in an upward direction.

What brought me to such an interest was from a wrist excersizer then known as the "DynaBee". Unique motions were observed when RPM threshold reached approx. 10,000 rpm. The DynaBee is twisted about where a weighted gyros pivotals rub on an inner flange after the gyro is started by the user.

This simple little sportsmans accessory is what sparked me off after repeatedly disturbing its axis thus resulting a force of precessional torque that I had called at the time as the "prime movement".

The prototype involved two main platforms...one above the other that would rotate in equal, exact opposite directions. Each of the platforms had three motor spun surplus gyros pivoted on their own two degree bearings. The third degree pivot was spring loaded as the main axis influenced by the resulting thrust force.

All gyros were brought to near 20,000 rpm then the platforms were rotated to about 45-50 rpm. The result was a fairly stable upward force.

Note at this point the energy to maintain prime speed was approximately 1/4that needed to bring all gyros to speed and stabilize.

My budget and lack for proper representation were not at the time. I am pleased to see confirmation of Mr. Kidd's work and welcome communications from him and his peers.

Thank you for your time and look forward to your replies.

V.R.
David A. Duca, KA9JSV

From: keelynet@ix.netcom.com (Jerry Decker)
Subject: Re: gravity5.asc
To: "duca@swcp.com" <David.A.Duca@swcp.com>

Re: gravity5.asc

Hi David!

Thank you for an excellent description of your experiments and source of inspiration for what I consider confirming information about Sandy Kidds invention. We were contacted by the TV show Beyond 2000 and they bought a set of KeelyNet disks...a very nice letter was included saying just from the information they had downloaded from a friends Australian KeelyNet mirror, they had enough info to do 2 years worth of shows but wanted the whole fileset while it was available...about 6 months to 1 year after this, they did a short video of Sandy Kidd that I have a copy of....it does not actually free levitate but instead seems to lift against a counterweight....

The other really hot correlations with this are Cook or Thornsens inertial drives....they use a cycloid motion to produce unidirectionaly thrust without needing a reaction medium....in other words, they appear to be able to move in ANY DIRECTION....I wrote this up in one of my past newsletters after seeing Thornsens video of how he propelled a canoe across a pool at 82 feet/min using only his inertial driver...no propeller or such touched the water, just these tiny forward jerks to pull the mass....quite incredible...

The hot correlation that I found energywise is in Russian researcher Chernetski as detailed in the PLASMAFE.ZIP article on KeelyNet, I will attempt to send both of these files to you though I've not had much success with file transmissions on the InterNet... Thank you very much for letting me know about your research in this area, I am truly fascinated!!!

There is no reason to negate the possibility of causing the electrons in atoms to form a cycloid AND with all atoms polarized so that each cycloid is driving in the same direction, the mass would simply move without all that mechanical garbage...!!!! Keely says you can use sound to 'graduate' a mass, causing all atoms and molecules to polarize (just means line up in this case) into what has now been actually created in a lab as a Bose Einstein Condensate!!! Dan Davidson and I wrote an article predicting this in Oct. of 94 that just got published in the June ITS (Tesla journal) and just this past week, two physicists in Boulder actually proved it with the creation of this strange form of matter...

One other point, Eric Laithwaite did a demonstration in front of Harold Aspden where he took a heavy metal disk suspended on a bearing and attached to a shaft.....you hold the shaft in both hands out in front of you and somewhat close to the body...then while the heavy disk is spinning, you try to life the shaft upwards.....it WON'T GO UP, it goes sideways and up, no matter how much force you use....successive still photos of this show that the arc prescribed is 32.8 degrees, (this might not be the EXACT NUMBER, but I am quoting from memory) which is exactly the angle found in DNA.....Aspden thinks this angle has free energy and other applications....

October 1995 Roundtable

Vanguard Sciences Roundtable Meeting

Greetings! This is your reminder for our 24th meeting of the Roundtable. Can you believe as of October, 94' this will be two years of monthly meetings?

Something really amazing seems to be congealing in the minds of many people with whom we all have been in contact or read about. It relates to what appears to be a Universal Principle manifesting in nature as a CYCLOID.

KeelyNet has long promoted the idea that geometry, frequency and spin are key elements necessary to achieve much of the phenomena we are trying to qualify and eventually quantify through a working and reproducible device.

Victor Schauberger proved the Cycloid form was most easily created by use of an egg shaped flow pattern. Rudolph Steiner also said the heart shaped flow produced an inflowing, life-giving rotation which nature used when building new life, healing or accumulating energy. The life-enhancing effects can be augmented by using magnets, crystals, copper and other elements in the right combinations. Now, there have arisen numerous correlations in the field of inertial and gyroscopic drives from researchers such as Dean, Cook, Laithwaite, Kidd and Thornsen among others.

One must realize that there is a difference between an inertial drive such as promoted by Dean, Cook and Thornsen and the precession effects of gyroscopic drives as investigated by Laithwaite and Kidd. In the case of inertial drives, the ideal system involves the creation of a cycloid motion, currently achieved by a complex mechanical rotation of one or more spinning weights.

The simplest form is a spring with a weight attached to the end of it and mounted on a rotating disk. You can see how the weighted spring can be released at the same point in the rotation of the disk to give a hopping action in a single preferred direction.

The spring slowly pulls the weight closer to the shaft as the disk spins away from the direction of the hopping motion, this allows the spring to 'recharge' during each rotation. The device then moves in short hops only in one preferred direction through the inertia of the moving weight when it is released at the same point during the disk rotation.

In the case for gyroscopic precession, a perpendicular motion in relation to the angular spin of the gyroscope will also produce a lifting force against the weight of the gyroscope. The claims are that weight is not eliminated but reduced from its norm. It is felt that further research along this line will yield a levitating device.

KOWSKY & FROST Gravity Nullification

PDF : Scan of original article & commentaries (*P.A.C.E. Newsletter* & Cox : *Antigravity Handbook*)

Science and Invention **(September 1927)**

Gravity Nullified

Quartz Crystals Charged by High frequency Currents Lose Their Weight

Gravity Nu

harged by High Frequency Cur- rents L

Fig. 1. The gravitation nullifier is shown in this illustration. The quartz crystal may be seen supporting a 25-pound weight. Dr. Kowsky is shown in a top coat because of the temperature at which the experiments were performed.

Although some remarkable achievements have been made with shortwave low power transmitters, radio experts and amateurs have recently decided that shortwave transmission had reached its ultimate and hat no vital improvement would be made in this line. A short time ago, however, two young European experimenters working with ultra-short waves, have made a discovery that promises to be of primary importance to the scientific world.

The discovery was made about six weeks ago in a newly established central laboratory of the Neuuartadline-Werke in Darreskein, Poland, by Dr Kowsky and Engineer Frost. While experimenting with the constants of very short waves, carried on by means of quartz resonators, a piece of quartz which was used, showed a clearly altered appearance. It was easily seen that in the center of the crystal, especially when a constant temperature not exceeding 10 C / 50 F was maintained, milky cloudiness appeared which gradually developed to complete opacity. The experiments of Dr Meissner, of the Telefunken Co,, along similar lines, according to which quartz crystals, subjected to high frequency currents clearly showed air currents which ld to the construction of little motor based on this principle. A week of eager experimenting finally led

Dr Kowsky and Engineer Frost to the explanation of the phenomenon, and further experiments showed the unexpected possibilities for technical uses of the discovery.

Some statements must precede the explanation. It is known at last in part, that quartz and some other crystals of similar atomic nature have the property when exposed to potential excitation in a definite direction, of stretching and contracting; and if one uses rapidly changing potentials, the crystals will change the electric waves into mechanical oscillations. This piezo-electric effect, shown in Rochelle salt crystals by which they may be made into sound-producing devices such as loud-speakers, or reversely into microphones, also show the results in this direction. This effect was clearly explained in August 1925 *Radio News* and December 1919 *Electrical Experimenter*. These oscillations are extremely small, but have nevertheless their technical use in a quartz crystal wave meter and in maintaining a constant wavelength in radio transmitters. By a special arrangement of the excitation of the crystal in various directions, it may be made to stretch or increase in length and will not return to its original size. It seems as if a dispersal of electrons from a molecule resulted which, as it is irreversible, changes the entire structure of the crystal so that it cannot be restored to its former condition.

The stretching out, as we may term this strange property of the crystal, explains the impairment of its transparency. At the same time a change takes place in its specific gravity. Testing it on the balance showed that after connecting the crystal to the high tension current, the arm of the balance on which the crystal with the electrical connections rests, rose into the air. The illustration, Fig. 3, shows this experiment.

This pointed the way for further investigation and the determination of how far the reduction of the specific gravity could be carried out. B the use of greater power, finally to the extent of several kilowatts and longer exposure to the action, it was found eventually that from a little crystal, 5 by 2 by 1.5 millimeters. A non-transparent white body measuring about 10 centimeters on the side resulted, or increased about 20 times in length on any side (See Fig. 4). The transformed crystal was so light that it carried the whole apparatus with itself upwards, along with the weight of 25 kilograms (55 lb) suspended from it and floating free in the air. On exact measurement and calculation, which on account of the excellent apparatus in the Darredein laboratory could be readily carried out, it was found that the specific gravity was reduced to a greater amount than the change in volume would indicate. Its weight had become practically negative.

There can be no doubt that a beginning has been made toward overcoming gravitation. It is to be noted, however, that the law of conservation of energy is absolutely unchanged. The energy employed in treating the crystal, appears as the counter effect of gravitation. Thus the riddle of gravitation is not fully solved as yet, and the progress of experiments will be followed further. It is, however, the first time that experimentation with gravitation which hitherto has been beyond the pale of all such research, has become possible, and it seems as if there were a way discovered at last to explain the inter-relations of gravity with electric and magnetic forces, which connection, long sought for, has never been demonstrated. This report appears in a reliable German journal, *Radio Umschau.*

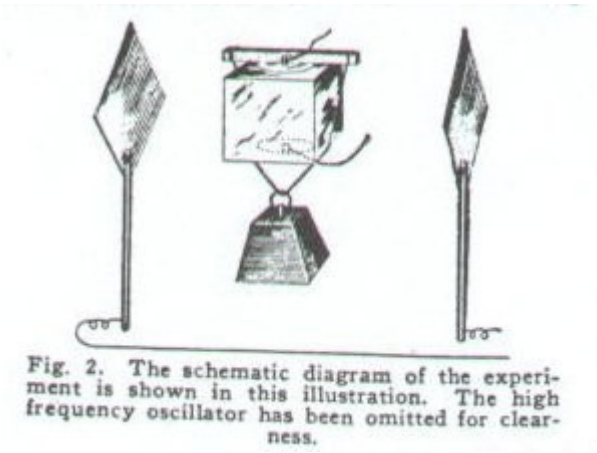


Fig. 2. The schematic diagram of the experiment is shown in this illustration. The high frequency oscillator has been omitted for clearness.

Eric LAITHWAITE Gyroscope Levitation

Anonymous: Unidentified magazine; "Scientist says Invention can Defy Gravity"
Eric Laithwaite & William Dawson: USP # 5,860,317; Propulsion System
Anon.: Unidentified magazine (Jan. 2, 1975): "Laithwaite's Amazing Invention"
Robert Walgate: *New Scientist* (14 Nov. 1974) ~ "Eric Laithwaite Defies Newton"
Bibliography

Eric Laithwaite

"Scientist says Invention can Defy Gravity"

London (AP) ~ A British scientist said yesterday he is on the threshold of inventing an antigravity motor that could fly a manned spaceship to the stars using nuclear fuel the size of a pea.

Eric Laithwaite, professor of heavy electrical engineering at London's Imperial College of Science and Technology, said the motor is based on the gyroscope, a rapidly spinning top that defies gravity. Gyroscopes already are used to guide spaceships.

"The motor is not easy to explain. If it was, others would have tried to produce one by now," said Laithwaite, who described himself as an astro engineer.

Laithwaite began working on the motor about six months ago after Edwin Rickman, who works with an electrical engineering firm, came to him with the idea. Rickman had patented it after he said it came to him in recurring dreams. Laithwaite incorporated in the device ideas of another amateur inventor, Alex Jones.

Although Laithwaite is far from the production stage with his motor to defy gravity, the 53-year old professor demonstrated his principle Friday at the Royal Institution at London.

Inside a box he brought before his distinguished audience were two electrically driven gyroscopes, each placed on a central pivot. Laithwaite made the gyroscopes rotate at high speed, and they rose into the air on the arms until they reached a curved rail that pushed them down again. The process then repeated itself.

With the two gyroscopes motionless, the box weighed 20 pounds on an ordinary kitchen scale. With the gyroscopes spinning, the contraption weighed 15 pounds.

Laithwaite said the loss of weight corresponded to the gravity loss produced by the spinning gyroscopes. Theoretically, the machine could produce weightlessness, Laithwaite said. A spaceship with his device could be blasted from the earth's gravitational field with conventional rocket fuel, Laithewaite said. Then, without friction to hamper the anti-gravity engine, nuclear power or solar energy could begin operating the gyroscopes and to drive the vehicle to other solar systems, he said.

Laithwaite is the inventor of the electrical linear motor capable of propelling a device through strong magnetic currents. He said the antigravity motor also could be adapted to drive ships and land vehicles silently but added: "Man is not interested in traveling horizontally. He always wants to go up."

Laithwaite said the antigravity motor is based on electromagnetism and vector multiplication "too complicated to explain."

Then he tried: "Let me put it this way: You take a go-kart with no engine and sit in it. It is loaded with a box of lead balls. If you throw one ball out behind you, you move forward a little. Throw another and you move farther still and so on. But if these lead balls were attached to a strong elastic band and could be sprung back into the go-kart, you would have continuous propulsion. That is what a gyroscope does when it moves from one plane to another."

United States Patent 5,860,317

(January 19, 1999)

Propulsion System

Eric Laithwaite & William Dawson

Abstract --- A propulsion and positioning system for a vehicle comprises a first gyroscope mounted for precession about an axis remote from the center of said gyroscope. A support structure connects the gyroscope to the vehicle. Gyroscopes are used to cause the first gyroscope to follow a path which involves at least one precession-dominated portion and at least one translation-dominated portion, wherein in the precession-dominated portion, the mass of the first gyroscope is transferred and associated movement of the mass of the remainder of the system in a given direction occurs, and, in the translation-dominated portion, the mass of the first gyroscope moves with an associated second movement of the mass of the remainder of the system in substantially the opposite direction, wherein the movement owing to the translation-dominated portion and is larger than the movement owing to the precession-dominated portion of the motion, hence moving the system.

Foreign Application Priority Data

May 05, 1994[GB] 9408982

Current U.S. Class: 74/5.34; 74/84S
Intern'l Class: G01C 019/02; F03G 003/08
Field of Search: 74/5.34,5.37,5.22,84 R,84 S

References Cited

U.S. Patent Documents
USP # 5,335,561 ~ Aug., 1994 ~ Harvey ~ Cl. 74/84.
Foreign Patent Documents
2,293,608 Jul., 1976 FR.
23-41 245 May., 1975 DE.
35 23,160 Jan., 1987 DE 74/5.
60-56,182 Apr., 1985 JP 74/5.
2,090,404 Jul., 1982 GB 74/5.
2,207,753 Feb., 1989 GB.
2,209,832 May., 1989 GB 74/5.
WO 91/02155 Feb., 1991 WO.

Description

BACKGROUND OF THE INVENTION

The present invention relates to a propulsion system for a vehicle. It has particular utility in the propulsion and/or positioning of space vehicles.

The majority of propulsion systems in use today rely either on exerting forces against the surface over which they travel (e.g. cars, trains, funiculars (via their supporting rope) etc.), accelerating material which comprises the medium through which they travel in a direction opposite to the direction in which they are being propelled (e.g. propeller aircraft, power driven or manually propelled boats), taking advantage of thermally or gravitationally derived energy gradients (e.g. sailing boats, gliders or surf boards) or ejecting material in the form of fuel carried by the vehicle, either in part as in the case of a jet engine or totally as in the case of a rocket engine. Hitherto, there has been no alternative but to employ the latter method in order to propel or position a vehicle in space.

A problem associated with propulsion systems utilising the latter method is that the volatile fuel required to be carried by the vehicle represents a danger to any crew in the vehicle, the vehicle itself and its contents.

Another problem associated with such propulsion systems is that the range and manoeuverability of the vehicle is limited by the amount of fuel carried.

Yet another problem associated with such systems is that once the vehicle is accelerated, it can only be decelerated by expending further fuel.

The invention may also have utility in specialised terrestrial applications. For example, much effort has been expended in attempting to quieten the propulsion systems of boats. By obviating the need for propellers or such like, the system according to the present invention may provide quieter propulsion than has hitherto been possible.

The principles underlying the present invention will now be explained with reference to and as illustrated in FIGS. 1-9 of the accompanying drawings in which:

One method of moving a space vehicle a short distance is illustrated in FIG. 1. A device (D) inside the vehicle is arranged to project or move an object (W), of significant mass in relation to the mass of the remainder of the vehicle from one end of the vehicle to a receptacle (B) at the other end. It is known that if the object (W) is so projected to the right in FIG. 1, the vehicle will move a distance to the left (to the position S) in FIG. 1. After that movement, the object (W) and the receptacle (B) are at the positions W' and B' respectively. The distance moved will approach the length of the vehicle if the mass of the object (W) is relatively large in comparison to the mass of the vehicle, or will approach zero if the mass of the object (W) is insignificant in comparison to the mass of the vehicle. In any case, the effect will be that the centre of mass of the vehicle and object will not move. For this reason, it is thought that such an activity is of little or no use in propelling a vehicle, since it is assumed that, in returning the object (W), the vehicle will necessarily undergo an equal and opposite displacement to that which it underwent when the mass was originally moved from one end of the vehicle to the other.

Another method of moving a vehicle a short distance is schematically illustrated in FIG. 2. FIG. 2 shows a vehicle (1), on which is mounted a base plate (2), which in turn carries a pivot (O). An arm OA of length R is mounted with one end on pivot (O) and the opposite end carries an object (W) of mass M.

If a force were to be applied to the object (W) with the intention of moving its mass M around the semi-circular arc ACB at speed v, it might be thought that the sum of the centrifugal force acting on the pivot (O) during that motion would have components only in the direction Y and therefore that the vehicle would be moved in the direction Y. However, this is not the case because the force needed to give the initial momentum Mv to the object W will always cancel the component of the centrifugal force. In fact, the application of the initial force to the object (W) will result in an equal and opposite force being applied to the vehicle (1) so that the object (W) and the vehicle (1) would rotate in opposite senses about the pivot (O).

The rotary part of this reaction can be neutralized by arranging for a second identical object (W1) arranged as a mirror image of the first object (W) to rotate in the opposite direction as shown in FIG. 3.

Referring to FIG. 3, if the two objects (W1, W2) are of large mass compared to the mass of the vehicle, then it will be seen that as they begin to move around their semi-circular paths they will exert a relatively large centrifugal force (initially towards the right in FIG. 3) on the vehicle (1) which will in turn will be accelerated to a relatively high velocity by this force owing to its relatively low inertia. As the two objects (W1, W2) approach the point B (having passed points C and E), they will then exert similarly large centrifugal forces to the left in FIG. 3 decelerating the vehicle until it returns to the condition it had when the objects (W1, W2) were launched. Hence

it will be seen that the motion of the objects (W1, W2) will be accompanied by an associated movement of the vehicle a distance D1 to the right as shown in FIG. 4. The vehicle moves from positions A to E in that Figure.

If, however, the objects (W1, W2) have a relatively low mass compared to the mass of the vehicle then they will exert a relatively small centrifugal force on the vehicle which will only be accelerated to a relatively low velocity owing to its relatively large inertia. When the masses then approach the point B (having passed points C and E), they will exert similarly low centrifugal forces on the vehicle in order to return it to its initial condition. Therefore, it will be seen that if the masses are relatively small (and hence the centrifugal force is less than in the previous paragraph), the vehicle will have moved a smaller distance D2 to the right. The motion of the vehicle in this case is illustrated in FIG. 5. It will be seen that the reduction of centrifugal force results in the vehicle moving a smaller distance. The vehicle moves from position A to position E in that Figure.

Consideration of the above two paragraphs and FIGS. 4 and 5, will show that the larger the relative mass of the objects (W1, W2) to the mass of the vehicle, the larger the displacement of the vehicle will be. If, for example, the vehicle were to be of negligible mass when compared to the sum of the masses of the objects (W1, W2), then the vehicle would move a distance 2R to the right in FIG. 3. If the vehicle were to have a mass equal to the sum of the masses of the objects (W1, W2), then the effect of the centrifugal force would be to move the vehicle a distance R to the right in FIG. 3.

It will be seen that, in each of the above examples, the centre of mass of the combined vehicle and object system remains in the same position.

As stated above, the fact that the centre of the mass of the combined system is not moved in each of the above examples means that such a method cannot be used to move a vehicle a distance greater than its own length.

However, if the centrifugal force exerted by the masses of the objects (W1, W2) as they travelled from position A to position B were to be reduced below the level seen in the examples above for that mass then the vehicle would be moved over a smaller distance. In other words, in a supposed first movement (in which centrifugal force is reduced), the vehicle would move a first (relatively short) distance in a direction opposite to the direction of movement of the masses.

Then, if the objects (W1, W2) were to be subsequently returned, in a second movement in which the centrifugal force was equal to that seen in the above examples, the vehicle would move a second (relatively long) distance in the opposite direction to the first movement. Clearly, after both the first and second movements had taken place the position of the objects (W1, W2) relative to the vehicle would be unchanged. Moreover, it will be seen that the combination of the first and second movements would result in a net movement of the vehicle and its contents in the direction opposite to said first movement. Hence, it will be seen how, if a way could be found of reducing the centrifugal force exerted by the objects (W1, W2) moving from one end of the vehicle to the other that the centre of mass of the combined system could be moved across space, that mass could thereby be transferred, and that the vehicle could be propelled through space.

It is well known that when a spinning gyroscope is mounted on a pivoted radius arm, so that the pivot is remote from the centre of the wheel forming the spinning mass of the gyroscope, and the gyroscope is subjected to a torque at right angles to the spin axis of the wheel (for instance by means of transfer through the radius arm) then the gyroscope precesses, that is rotates, about a precession-axis that is at right angles both to the spin-axis of the wheel and the applied torque provided that it is free to do so.

FIG. 6 shows a plan view of a spinning wheel, all of whose mass may be considered to be concentrated in its rim of negligible thickness and of radius r. The wheel is connected to a pivot (O) (which forms the centre of precession) by a light rod of length R. A torque T is applied to the wheel in the direction shown.

The mechanism of precession may better be understood by considering the highest and lowest points of the rim of the spinning wheel as illustrated in FIGS. 7A and 7B.

From FIGS. 7A and 7B, the application of the torque T may be considered as tantamount to the application of a force F1 to the top point of the spinning wheel and a force F2 to the bottom point of the spinning wheel, deflecting them and causing a change in the direction of their velocities from v to v' as shown. Thus both velocity vectors are deflected clockwise. It will be realized that an object whose velocity is constantly changing in a direction at right angles to its current velocity moves in a circle.

By conventional two-dimensional mechanics, a non-precessing mass moving in a circle only does so if it is subjected to a constantly applied force defined as the `centripetal` force.

The present inventors realised that by applying oppositely directed forces, (the effect of a torque,) to particles that are themselves, moving in opposite directions as a result of being part of the rim of a spinning wheel they could cause the spinning rim to circle about O without requiring a centripetal force.

It is known that a convenient means (for demonstration purposes) of applying a constant torque to a gyroscope is to offset the gyroscope on a shaft, which is supported at the end remote from the gyroscope by a joint, that allows the shaft to move both laterally and up and down, and to allow the weight of the gyroscope, together with the reaction force at the joint, to be the forces that apply the torque.

It is also known that when the wheel is spun up, suspended and released in this manner the gyroscope will precess at a rate .OMEGA. derived from the equation:

$$\left\{ \begin{array}{c} T = I\Omega\omega \\ \text{OR} \\ MgR = I\Omega\omega \end{array} \right\}$$

Where: T--MgR--torque at right angles to shaft

M --- mass of the wheel

g --- acceleration due to gravity

R --- length of the shaft

I --- moment of inertia of wheel

.omega. --- angular spin velocity of wheel

Further, it will precess about any point in the precessional plane so long as it is launched with initial conditions such that it finds itself travelling at the linear tangential velocity R..OMEGA. where .OMEGA. is determined from equation (1) inserting the value for the torque that so obtains.

With reference to FIG. 8, the present inventors realised that if two gyroscopes of identical mass M and spinning at the same speed .omega., but in opposite directions to one another, were mounted on equal rods with their remote ends pivoted in a frame (0,0') of negligible weight

which was itself unrestrained, and were launched in an arc from A to B by whatever means (P), be it a spring, motor, ramp or chemical reaction, in such a way that, at the moment they found themselves being acted on by gravity supplying the torque, their launch velocity was exactly R..OMEGA. where:

$$\Omega = \frac{M.g.R.}{I\omega}$$

then the resulting motion (in the event of the gyroscopes being `perfect` (see below)), would not involve a centrifugal force being exerted on the frame (0,0'), that the frame would not therefore be deflected and that the centre of mass of the system would move a total distance of 2R.

It will be appreciated that if the wheels were not spinning and were then just `dead` masses and were given the same treatment (as far as that is possible given that they would then have NO TENDENCY to move of their own volition when subjected to a torque and would therefore have to be projected with considerable velocity to achieve a similar result), then the frame (0,0') would, (as explained with reference to FIG. 3), be deflected from a distance R from one side of the wheels to a distance R on the other side. The centre of mass of the system would not move.

The present inventors have conducted experiments which show that when a gyroscope is caused to precess by a torque whatever additional angular momentum it acquires combines with the angular momentum already in the spinning mass and if the axis about which it is caused to precess is remote from the centre of the wheel, that an additional linear momentum proportional to the linear tangential velocity of the total moving mass of the gyroscope about that said axis of precession is the only extra dynamic requirement. The experiments conducted further show that, once the gyroscope has been launched on its path of precession about a remote axis as described, the forces exerted by the gyroscope at that axis are largely those involved with application of torque to the gyroscope. Such forces that pass through the axis normal to the tangent at any point in the precessional path of the gyroscope are less than those calculated from the conventional formulae for derivation of centrifugal force of a non-precessing mass. Thus it follows that, provided it is correctly launched, the centre of mass of a gyroscope may be moved around a circle of precession from the one end of a diameter to the other without the full corresponding net force at the centre of precession.

The present inventors further realised that if the mass of the gyroscope could be transferred predominantly by a precession of the gyroscope without a substantial movement in the vehicle, (i.e. providing the first movement referred to above) and thereafter the mass of the gyroscope were to be returned to its original position in relation to the vehicle by means not involving precession (deriving the momentum for that movement from the remainder of the system) (i.e. providing the larger second movement referred to above), then the vehicle would be moved and if this cycle were to be repeated the vehicle would be propelled.

It is arranged that in the precessional motion of FIG. 8, the gyroscopes derive their momentum from each other.

According to a first aspect of the present invention there is provided a method of moving a vehicle in a first direction, which method comprises the steps of : connecting at least one gyrocope means to said vehicle; causing said gyroscope means to follow a path which involves at least one precession-dominated portion and at least one translation-dominated portion,

wherein in the precession-dominated portion, the mass of the gyroscope means moves in said first direction and an associated first movement of the vehicle in substantially the opposite

direction to said first direction occurs, and, in the translation-dominated portion, the mass of the gyroscope means moves with an associated second movement of the mass of the vehicle in substantially said first direction, wherein said second movement is greater than said first movement and hence the vehicle moves in said first direction.

According to a second aspect of the present invention there is provided an apparatus for propelling a vehicle in a first direction, which apparatus comprises:

at least one gyroscope means adapted for precessional motion about an axis remote from the centre of said gyroscope means; means for causing the gyroscope means to follow a path which involves at least one precession-dominated portion and at least one translation-dominated portion,

wherein in the precession-dominated portion, the mass of the gyroscope means moves in said first direction with an associated first movement of the vehicle in substantially the opposite direction to said first direction, and, in the translation-dominated portion, the mass of the gyroscope means is moved with an associated second movement of the vehicle in substantially said first direction; and

wherein said second movement is greater than said first movement and hence the vehicle moves in said first direction.

Furthermore, the present inventors have conducted experiments which show that if the mass of the wheel of the gyroscope is not concentrated at an infinitely thin rim then an amount of centripetal force is developed which is required to constrain all parts to a circle, or precess, about the same centre 0. However, these experiments have verified that the centripetal force is still less than that predicted by the conventional formula for non-precessing masses.

The practical situation that would thereby be obtained is illustrated in FIG. 9. The gyroscopes would, as a result of their not being `perfect`, exert some centripetal force on the frame (0,0'). The frame would be moved a distance to the right as shown in that Figure, so that by the time the frame (0,0'), had moved from S to T, the gyroscopes have moved to Q and Q' respectively. However, when the gyroscopes are subsequently returned to the right hand side of the frame, the frame will be displaced by a distance 2R to the left in FIG. 9. Therefore, the combined result of the precessional motion and the translational motion would be to move the frame from position S to position U, i.e. over a distance less than the distance 2R obtained in the perfect case of FIG. 8 but nevertheless with a resulting movement in the centre of mass of the system that would not be achieved with `dead` masses.

Advantageously then, a high proportion of the mass of the gyroscope means lies in a plane at right angles to the spin axis of said gyroscope means and is located at a predetermined distance from said spin axis of the gyroscope.

Other experiments have shown that the greater the wheel spin velocity .omega. is in relation to the precessional velocity .OMEGA., the less centripetal force is developed. .OMEGA. and .omega. are related to the applied torque T and the moment of inertia I of the wheel by equation (1).

Preferably, the ratio of the angular velocity of the gyroscope means about its spin axis to the angular velocity of said precession is maximised.

In the absence of a gravitational field the torque to cause the gyroscope to precess in the first place has to be provided. This may conveniently be obtained from an identical gyroscope spinning in the opposite direction and with the same angular velocity as the gyroscope against

which it is to be reacted so that the torque being applied to one gyroscope is equal and opposite to the torque on the other gyroscope, the net torque on the vehicle is nil and the two gyroscopes then precess in the same direction, as a pair, about a centre.

Preferably therefore, the apparatus comprises at least first and second gyroscope means such that the torque required for the precession of the first gyroscope means is provided by the second gyroscope means.

In order for this first pair of gyroscopes to precess about a centre remote from the centre of the gyroscopes, they must, as previously stated, be given a linear momentum proportional to their prospective linear tangential velocity when subjected to the applied torque. In a preferred embodiment of the invention this linear momentum may conveniently be derived from an identical pair of gyroscopes with identical attributes arranged as a mirror image of the first pair. In this arrangement the linear momentum required to launch each pair of gyroscopes on their precessional paths are equal and opposite and cancel out so that the net momentum outside the system is nil. Similarly when the two pairs of gyroscopes reach their diametrically opposite point the linear momentum, delivered when the torques are removed, are again equal and opposite and again cancel out leaving no net momentum outside the system.

Preferably then the apparatus comprises at least first and second gyroscope means such that the linear momentum required by said first gyroscope means in order to precess about an axis remote from its centre is derived from the second gyroscope means precessing in the opposite sense.

Advantageously, the apparatus comprises at least first and second pairs of gyroscope means, the torques required by each gyroscope means being provided by the other of said pair, and each pair providing the linear momentumrequired by the other pair.

Preferably, the path of the gyroscope means is such that the motion of the gyroscope means varies continuously between a substantially entirely precessional motion and a substantially entirely translational motion, thereby providing a smooth propulsion to the system.

A smoother propulsion can also be obtained by providing a plurality of groups of gyroscope means and arranging each group to impart said second movement the vehicle at a different time.

Some embodiments of the present invention utilise a gyroscope means which comprises a wheel which is driven by a central hub. A problem associated with such embodiments is that the degree of propulsion that can be provided by the apparatus is limited by the strength of the materials making up the hub itself.

Preferably therefore, said gyroscope means comprises a substantially annular rim which is driven by a means in contact with that rim.

Furthermore, the rim is preferably rotatably supported at a plurality of points around the rim. This has the further advantage that the level of propulsion that can be provided by the apparatus is increased in accordance with the number of means rotatably supporting the rim.

In a preferred embodiment of the present invention, the gyroscope means comprises two counter-rotating annuli which are retained in a frame means. This has the advantage that the torques exerted by each rim substantially cancel one another and that substantially no net torque is exerted by the frame on the vehicle.

The invention will now be described further, with reference to and as illustrated in FIGS. 10 to 28 of the accompanying drawings in which:

DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is an illustration of a first method of moving a vehicle a short distance.

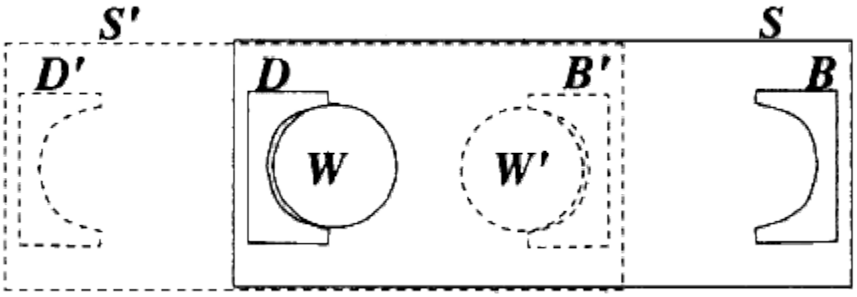


figure 1

FIG. 2 and **FIG. 3** are illustrations of a second method of moving of a vehicle a short distance.

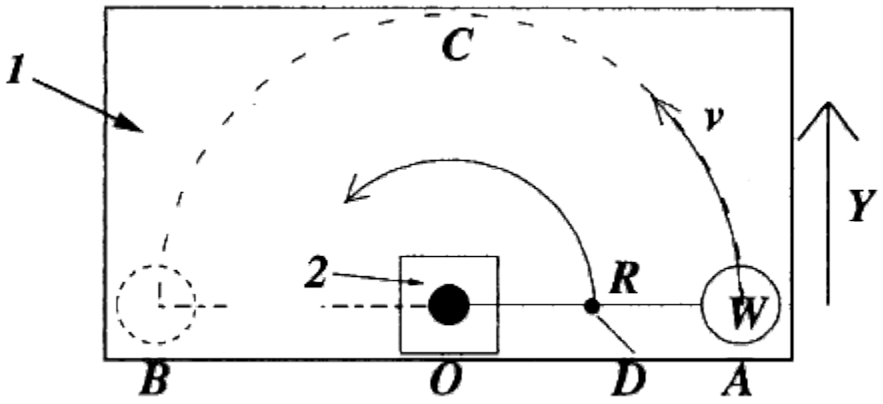


figure 2

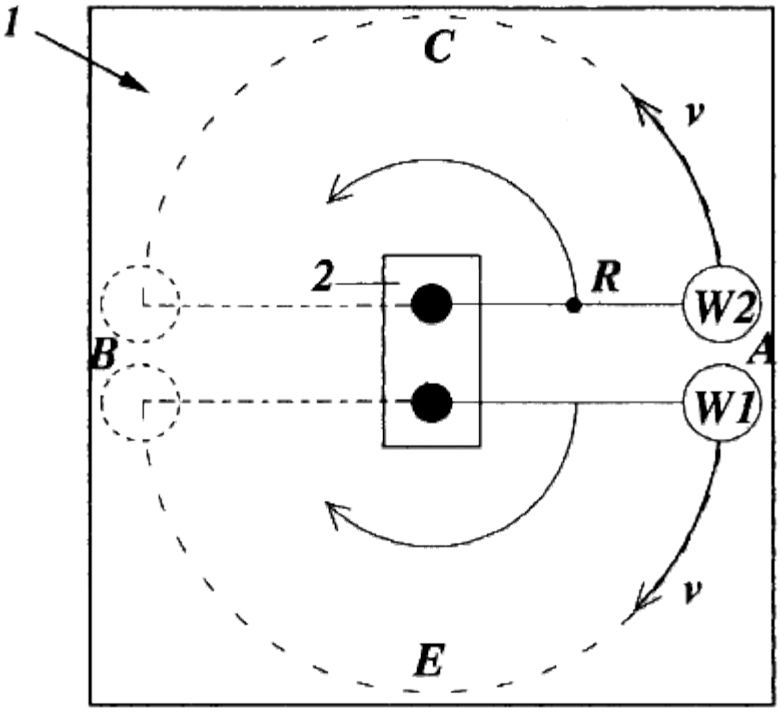
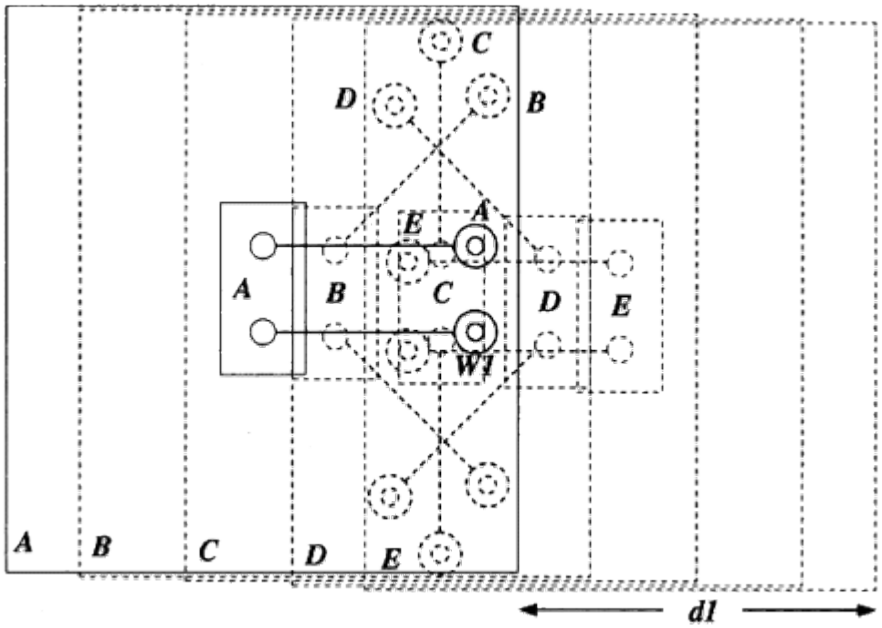


figure 3

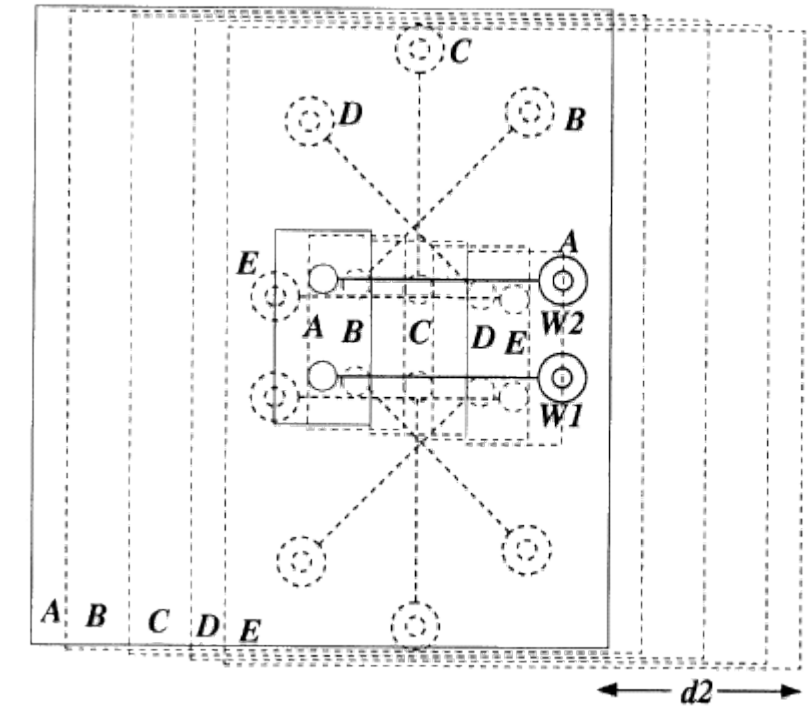
FIG. 4 is an illustration of the motion of the vehicle of FIG. 3 if the masses of W1 and W2 are relatively large in comparison to the mass of the vehicle.



For clarity the subsequent positions of B, C, D and E are shown displaced vertically with respect to A

Figure 4

FIG. 5 is an illustration of the motion of the vehicle if the masses of W1, W2 are relatively all in comparison to the mass of the vehicle.



For clarity the subsequent positions of B, C, D and E are shown displaced vertically with respect to A

Figure 5

FIG. 6 is a schematic illustration of a gyroscope adapted to precess about an axis remote from the center of the gyroscope.

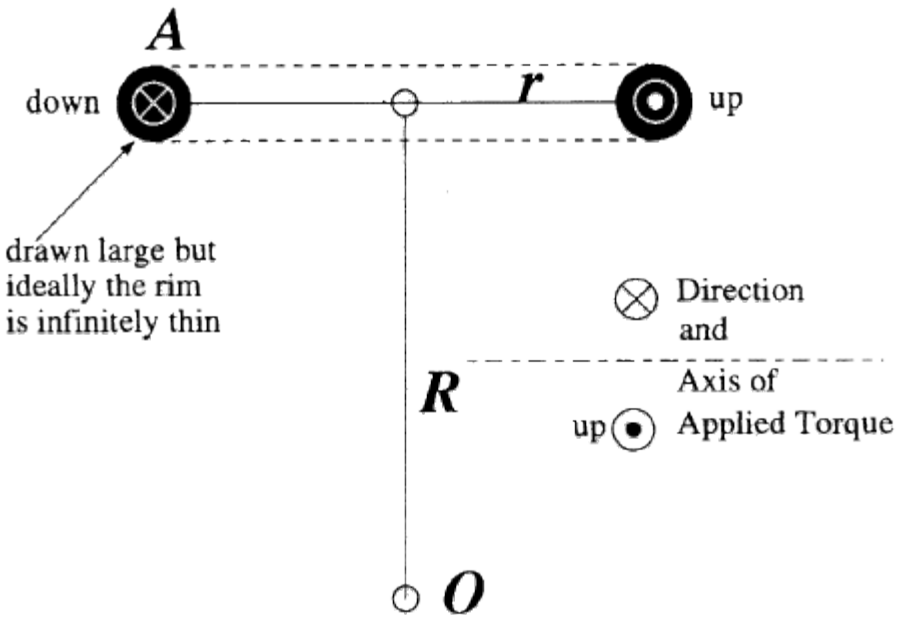


figure 6

FIG. 7A and **FIG. 7B** together form a schematic illustration of how a gyroscope can move in a circle as a result of a torque being applied at right angles to the spin axis of the gyroscope, without requiring the application of a centripetal force to the center of the precession.

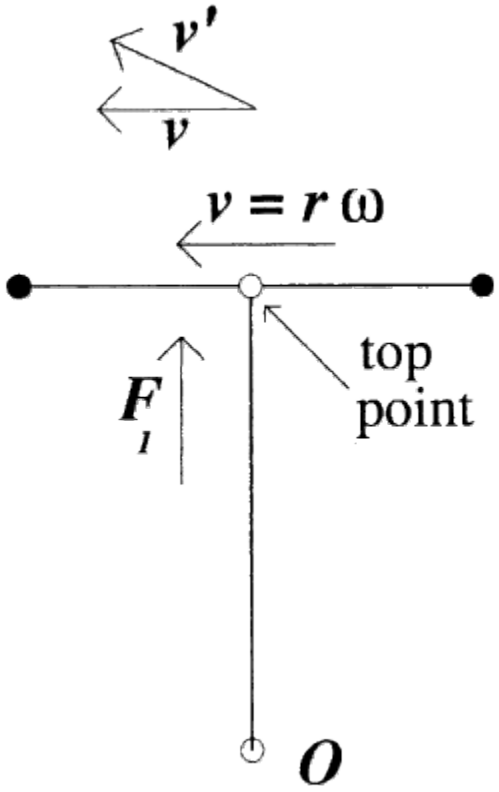


figure 7A

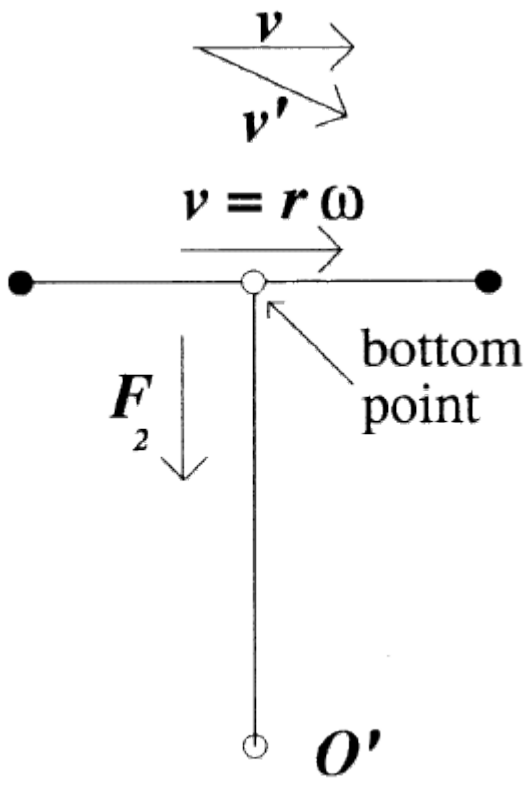


FIG. 8 is a schematic illustration of an apparatus which can be used to demonstrate the principle underlying the present invention.

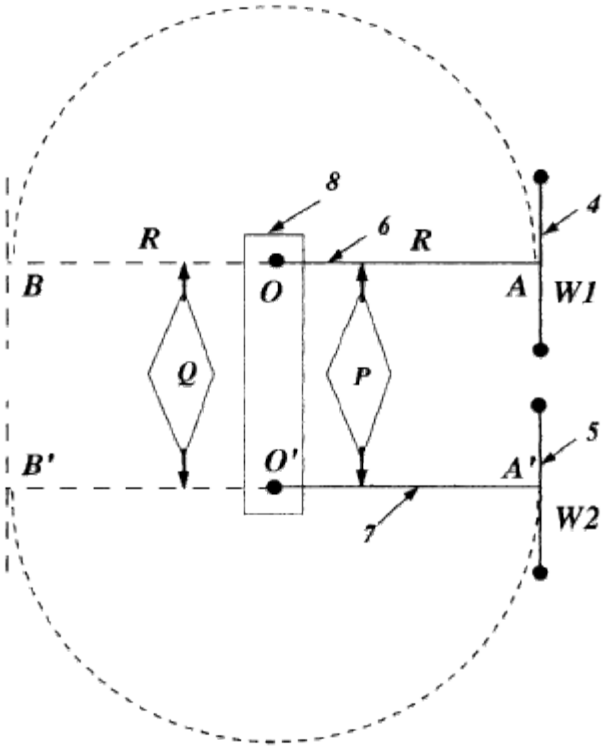


figure 8

FIG. 9 is a schematic illustration of the motion of the apparatus of FIG. 8 if the wheels employed therein are imperfect.

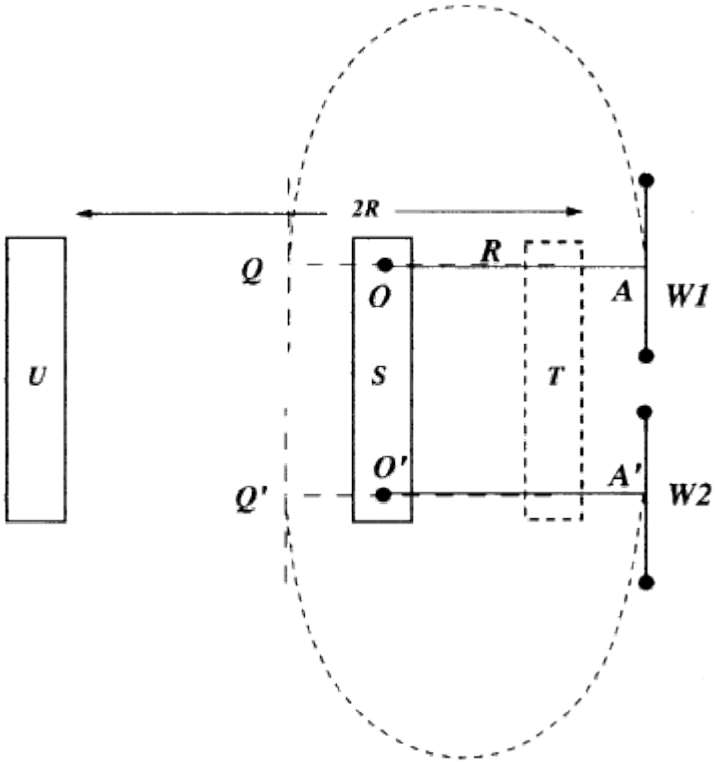


figure 9

FIG. 10 is a perspective view of one of four identical gyroscopic devices that comprise the first embodiment of the present invention.

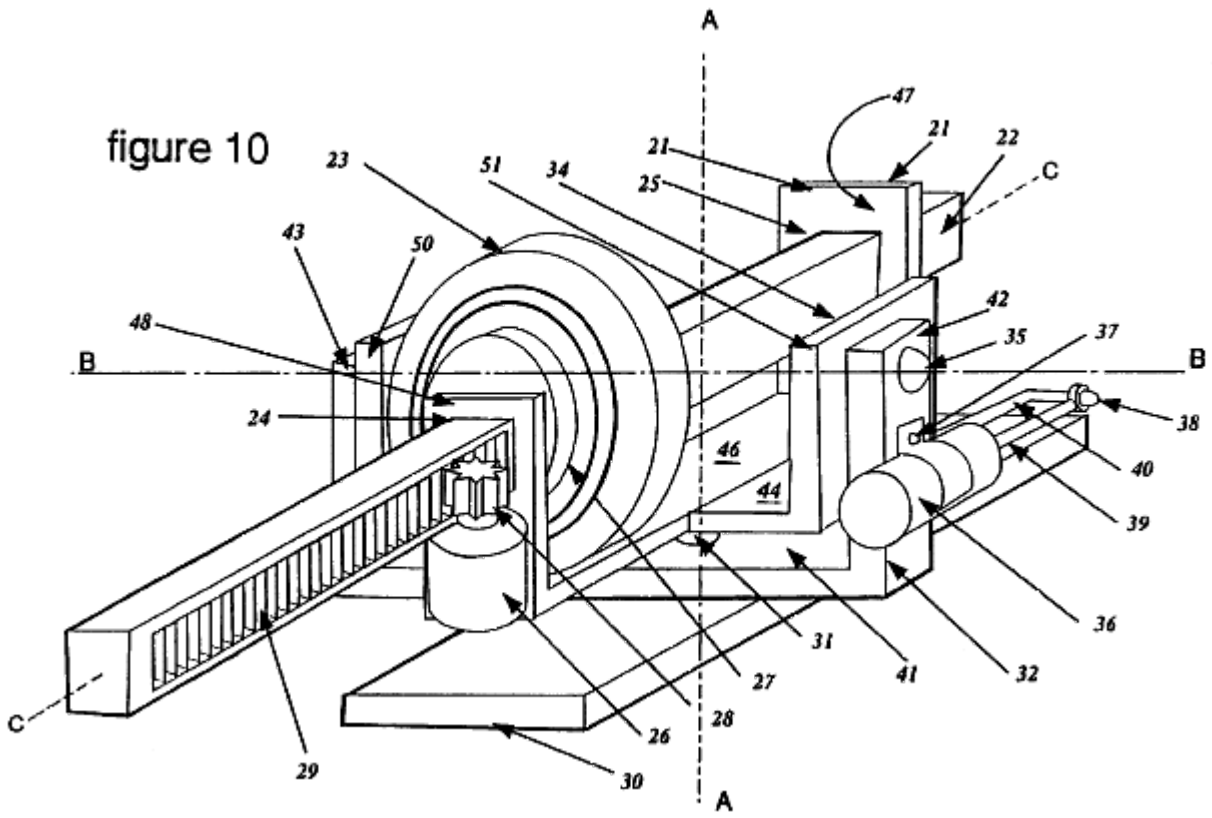


FIG. 11 illustrates the cycle of operations of one of four identical gyroscopic devices that comprise the first embodiment of the present invention.

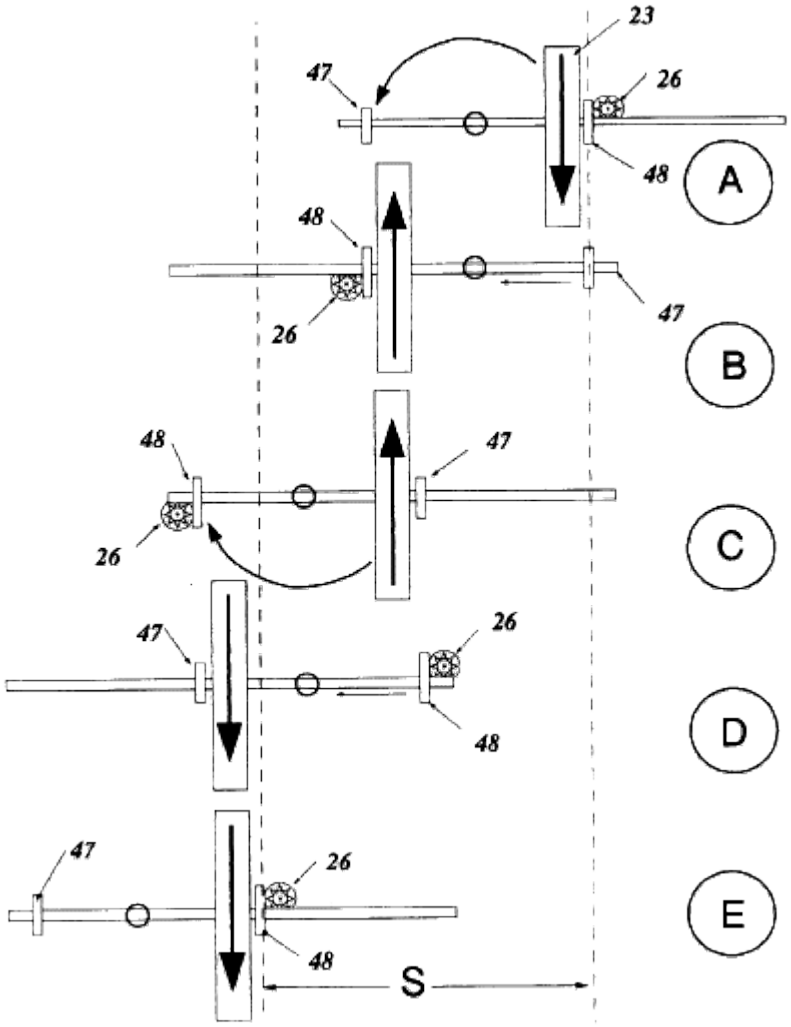


figure 11

FIG. 12 is a perspective view of a constituent part of a second embodiment of the present invention.

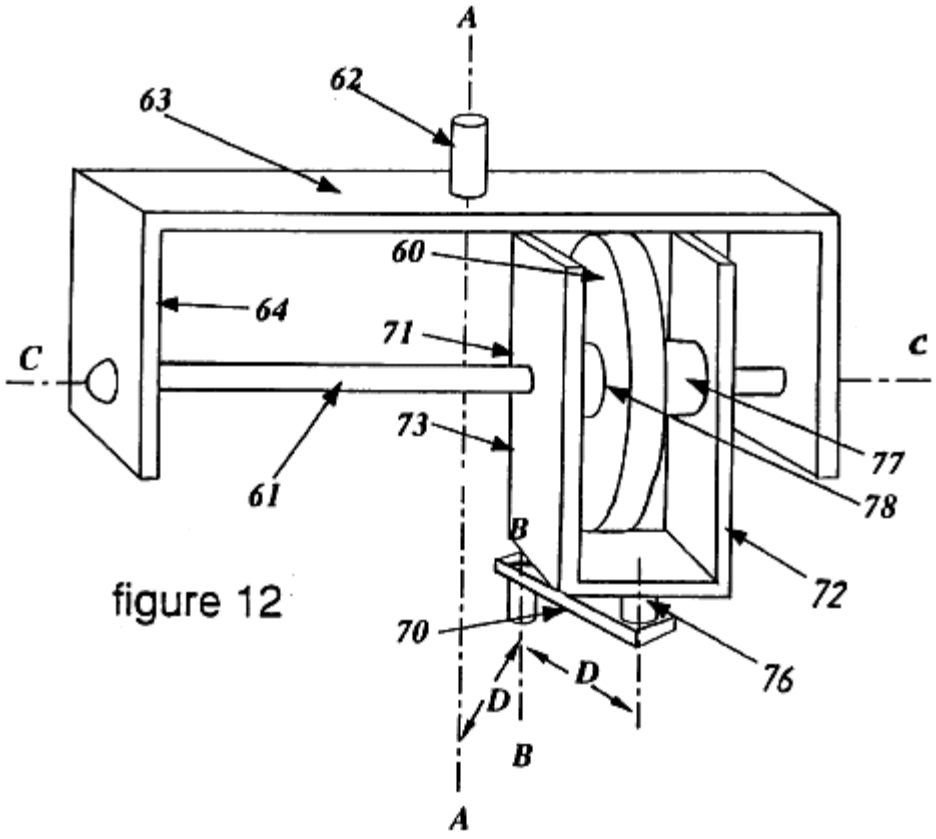


FIG. 13 illustrates the motion of the one of the gyroscopes in the second embodiment of the present invention.

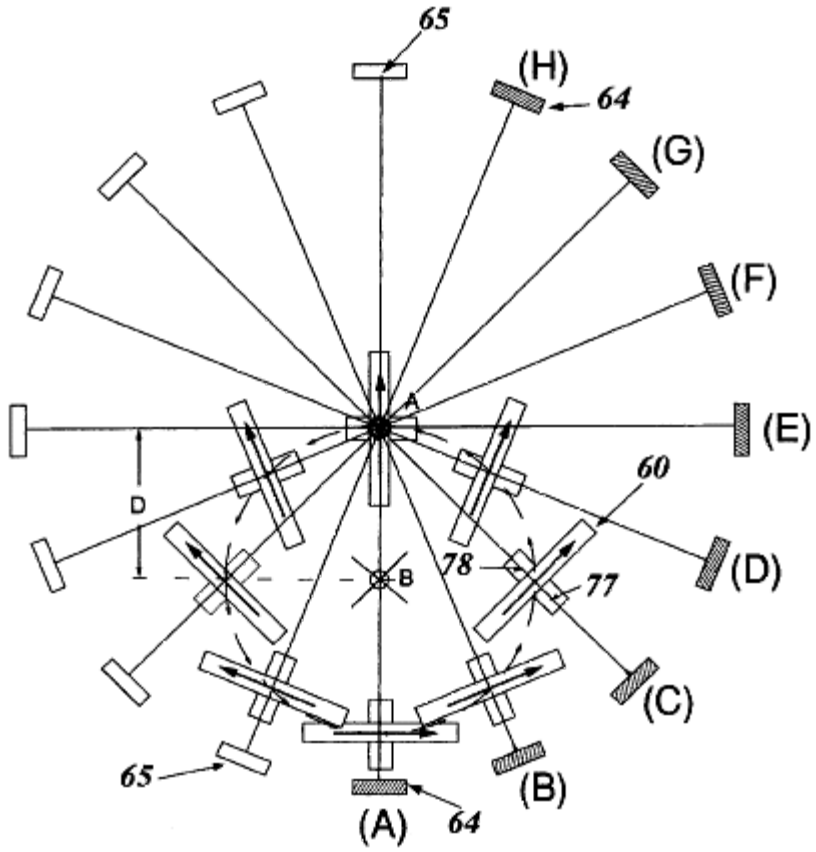


figure 13

FIG. 14 is a perspective view of four such constituent parts as illustrated in FIG. 12 combined so as to eliminate substantially any net torque on the vehicle being propelled.

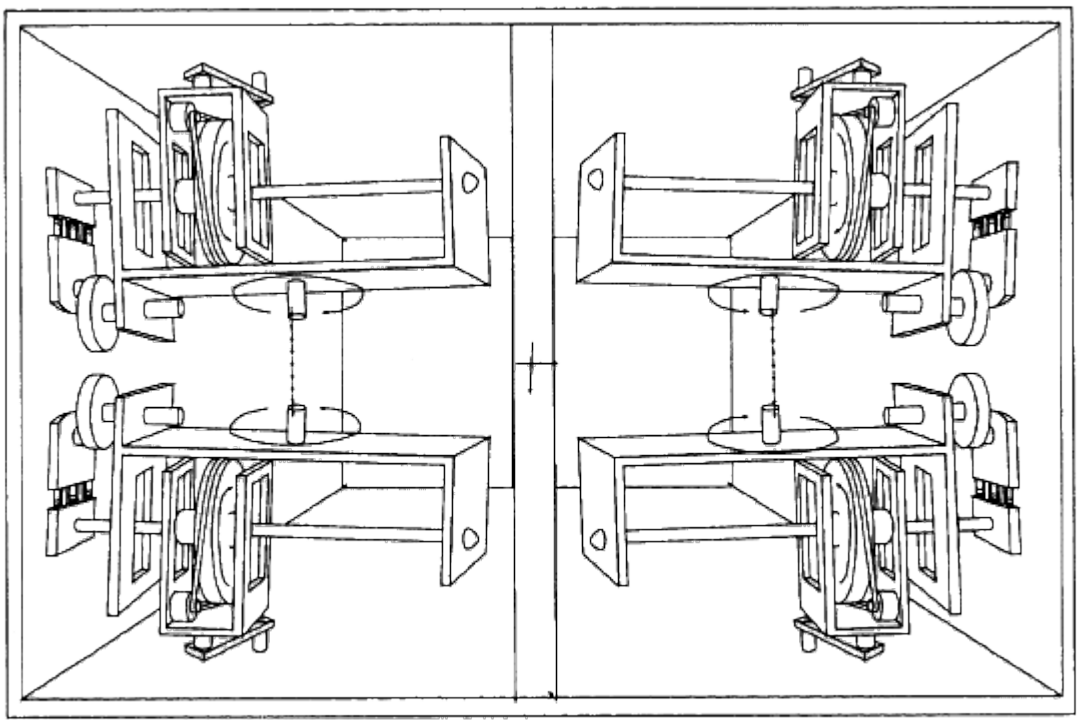


figure 14

FIG. 15 is a schematic view of an apparatus, the view being used to explain the operation of a third embodiment of the present invention.

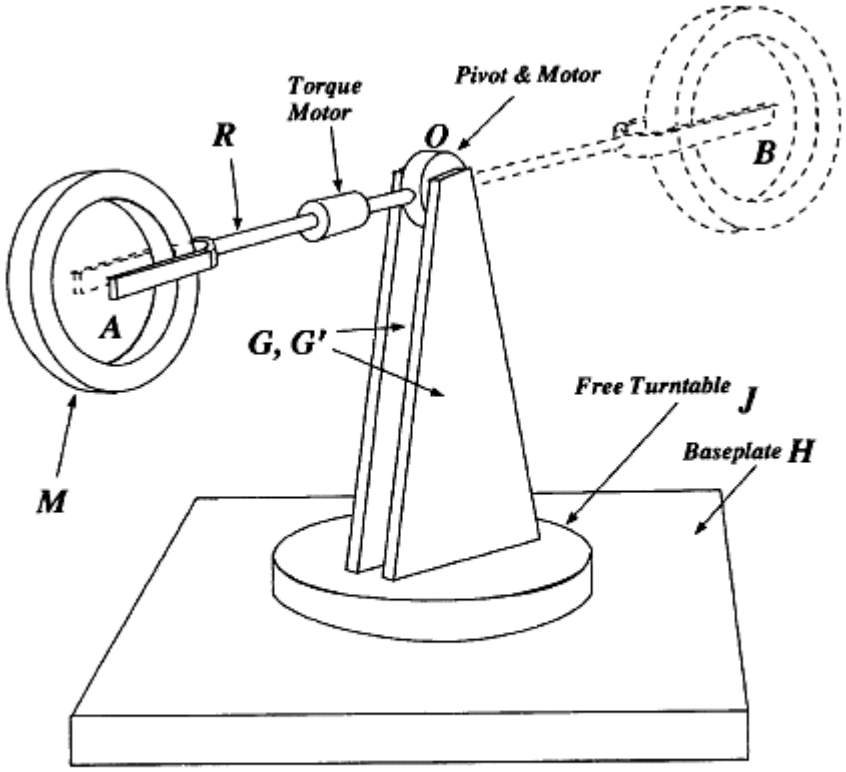


figure 15

FIG. 16 is a perspective view of a constituent part of a third embodiment of the present invention and illustrates the three dimensional space required for motion of that part.

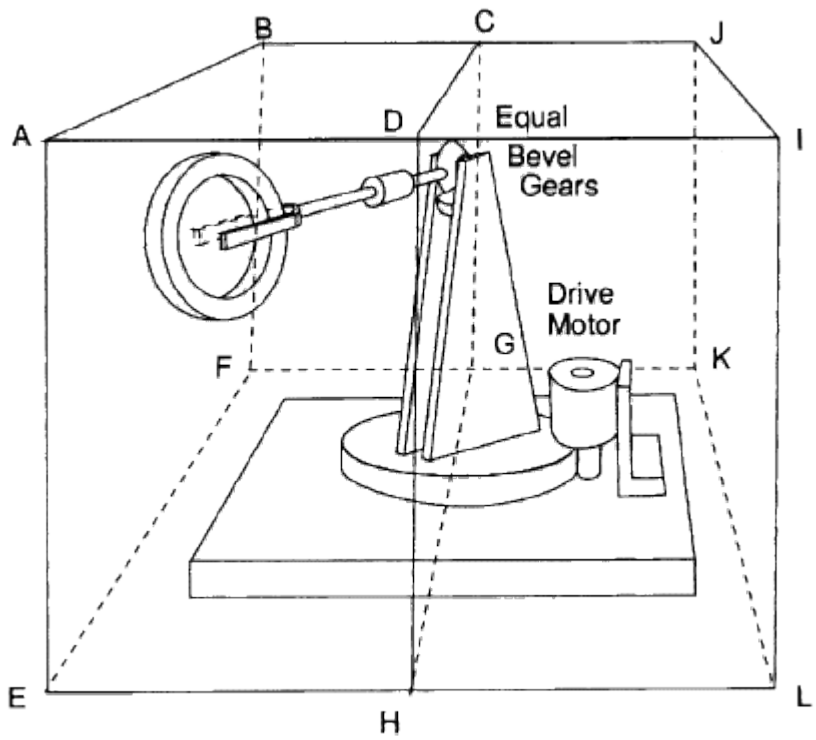


figure 16

FIG. 17 is a perspective view of four such constituent parts as illustrated in FIG. 15 combined so as to eliminate substantially any net torque on the vehicle being propelled.

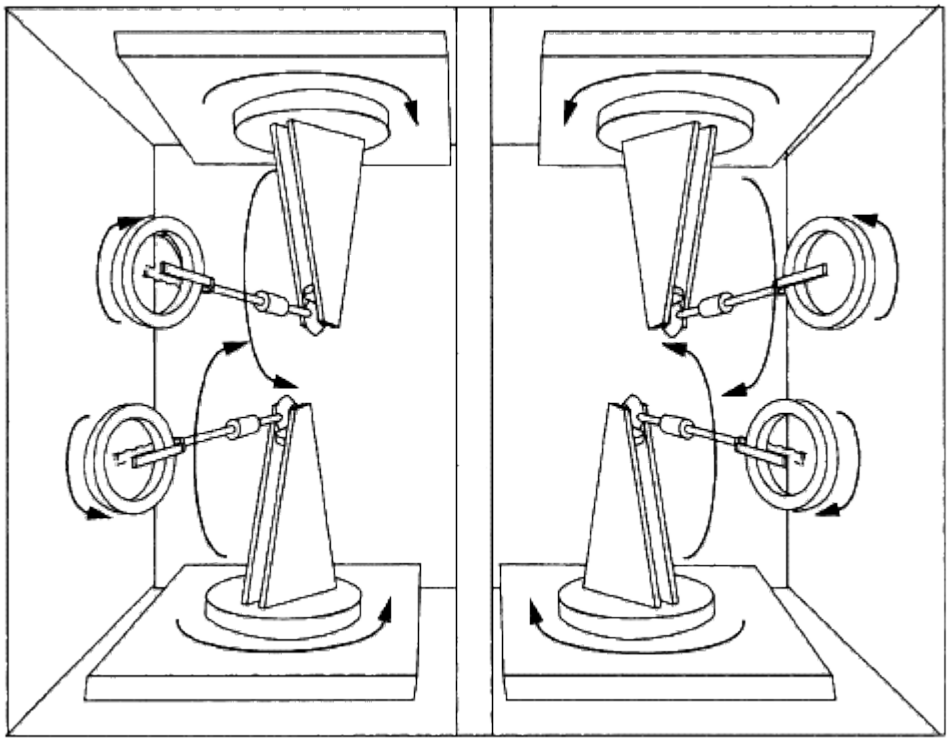


figure 17

FIGS. 18, 19 & 20 are diagrammatic representations of the forces developed during one cycle by a single gyroscope in the third embodiment of the present invention.

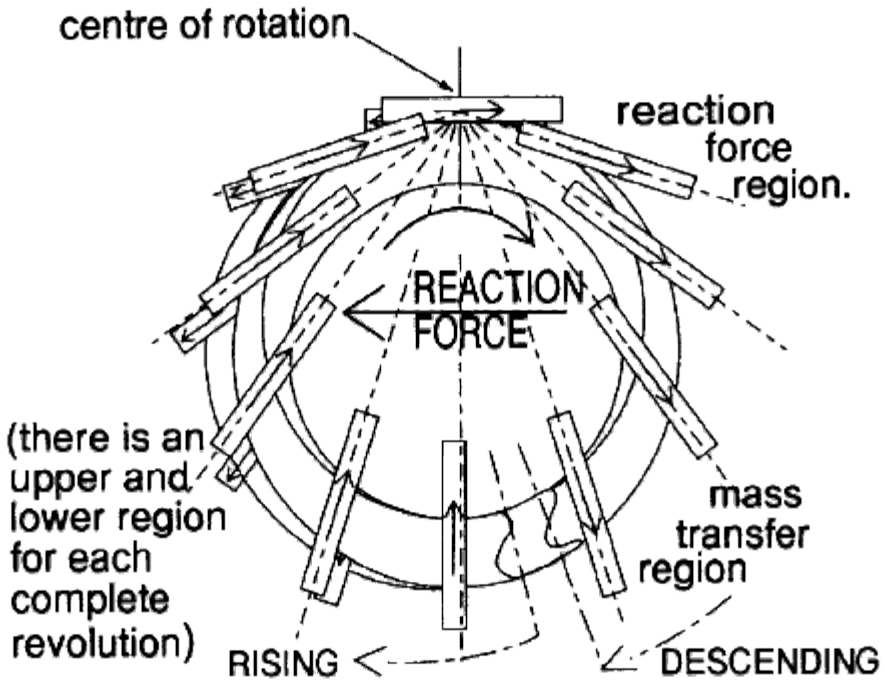


figure 18

figure19

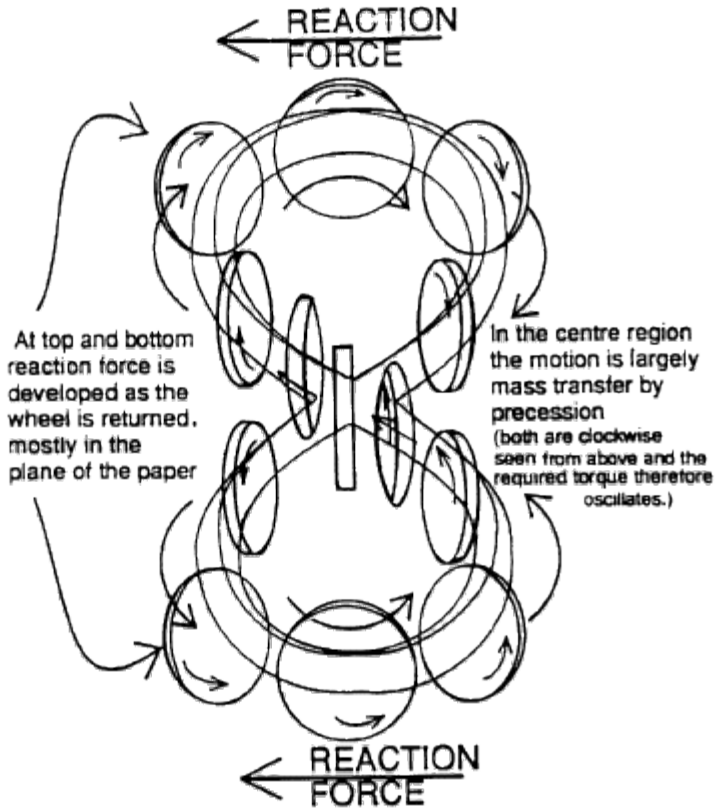

REACTION FORCE
At top and bottom reaction force is developed as the wheel is returned, mostly in the plane of the paper
In the centre region the motion is largely mass transfer by precession (both are clockwise seen from above and the required torque therefore oscillates.)
REACTION FORCE

figure 20

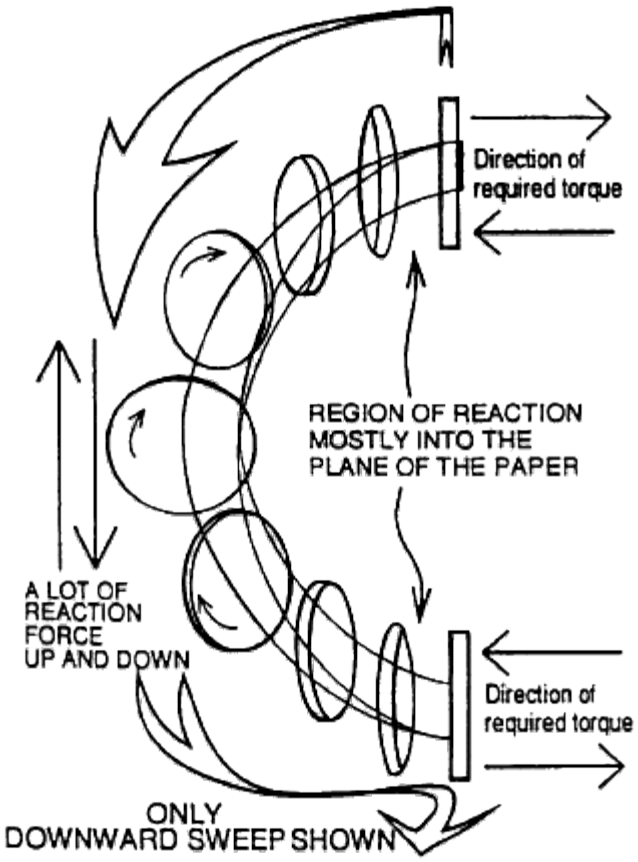


FIG. 21 is a view in plan and elevation of a constituent part of a fourth embodiment of the present invention.

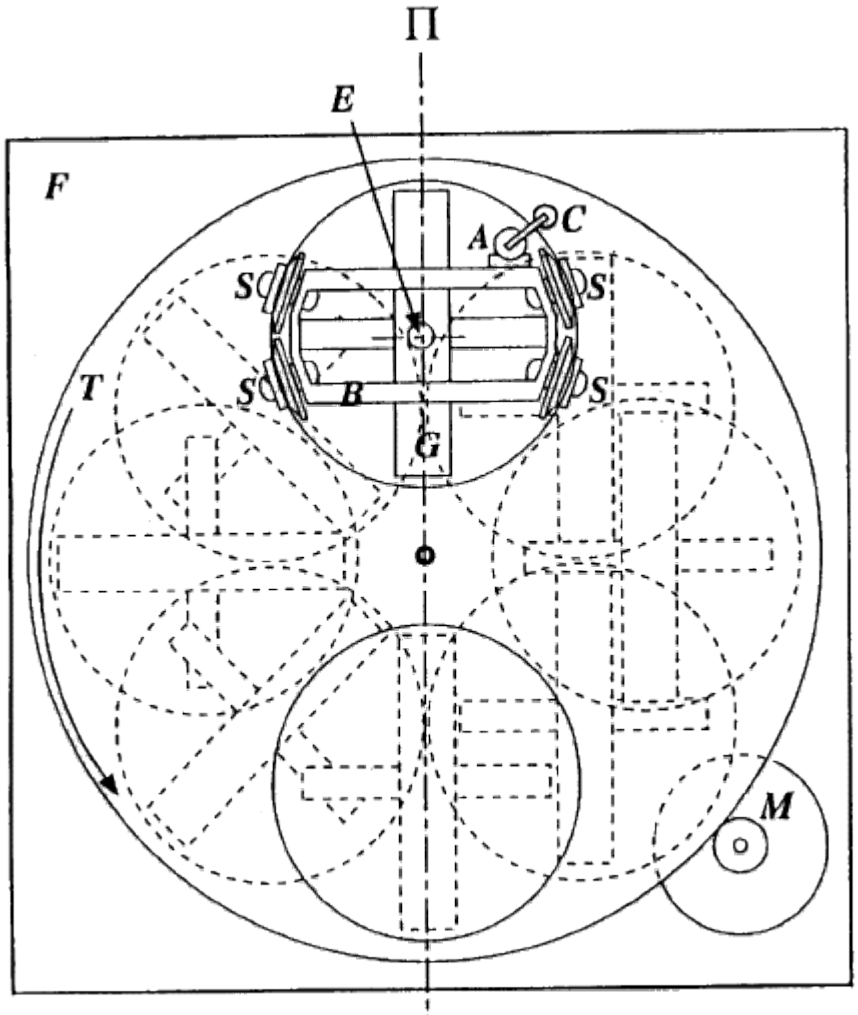


Figure 21A

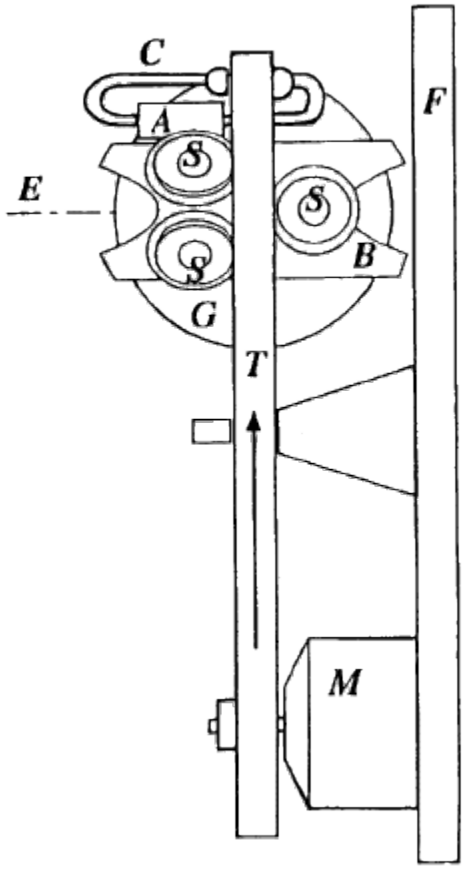


Figure 21B

FIG. 22 is a view in elevation of four such constituent parts as depicted in FIG. 21 and arranged to eliminate any net torque on the vehicle.

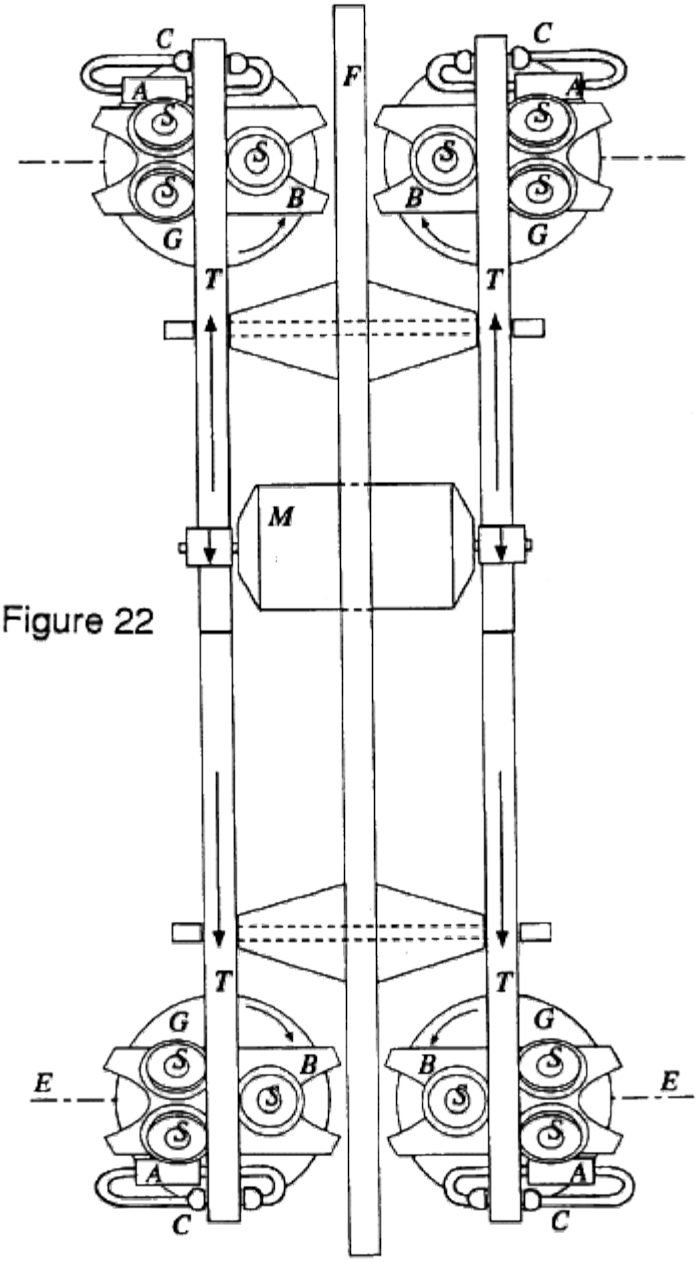


Figure 22

FIG. 23 is a perspective diagram of a fifth embodiment of the present invention so designed to maximise the mass of the gyroscope means both lying in a plane at right angles to the spin axis of the gyroscope means and being located at a predetermined distance from the spin axis and which is capable of being substituted for any two counter rotating single gyroscopic means in any of the preceding four embodiments.

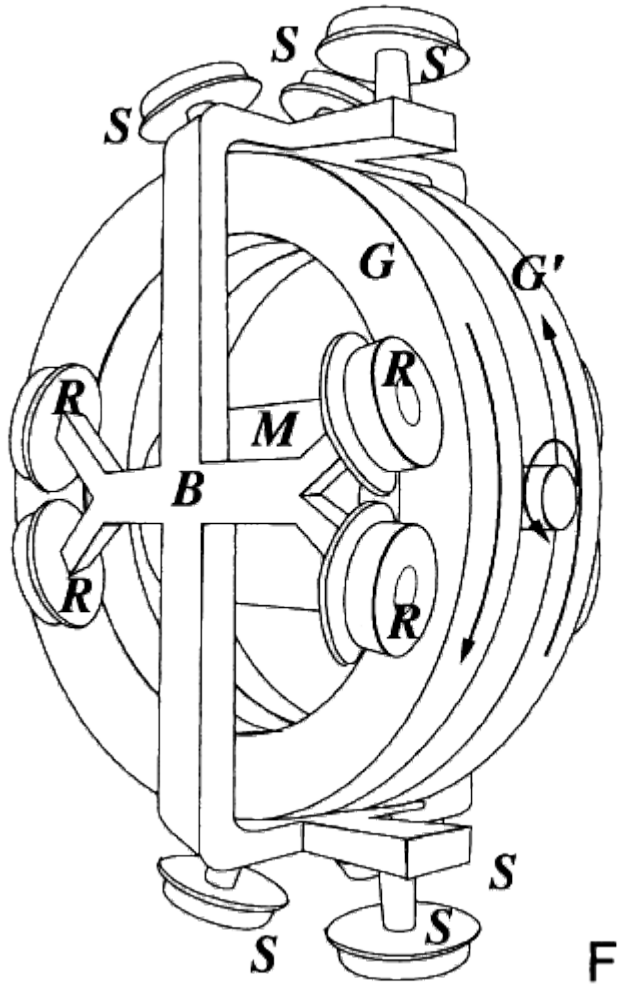


Figure 23

FIG. 24 shows the fifth embodiment incorporated into the fourth embodiment.

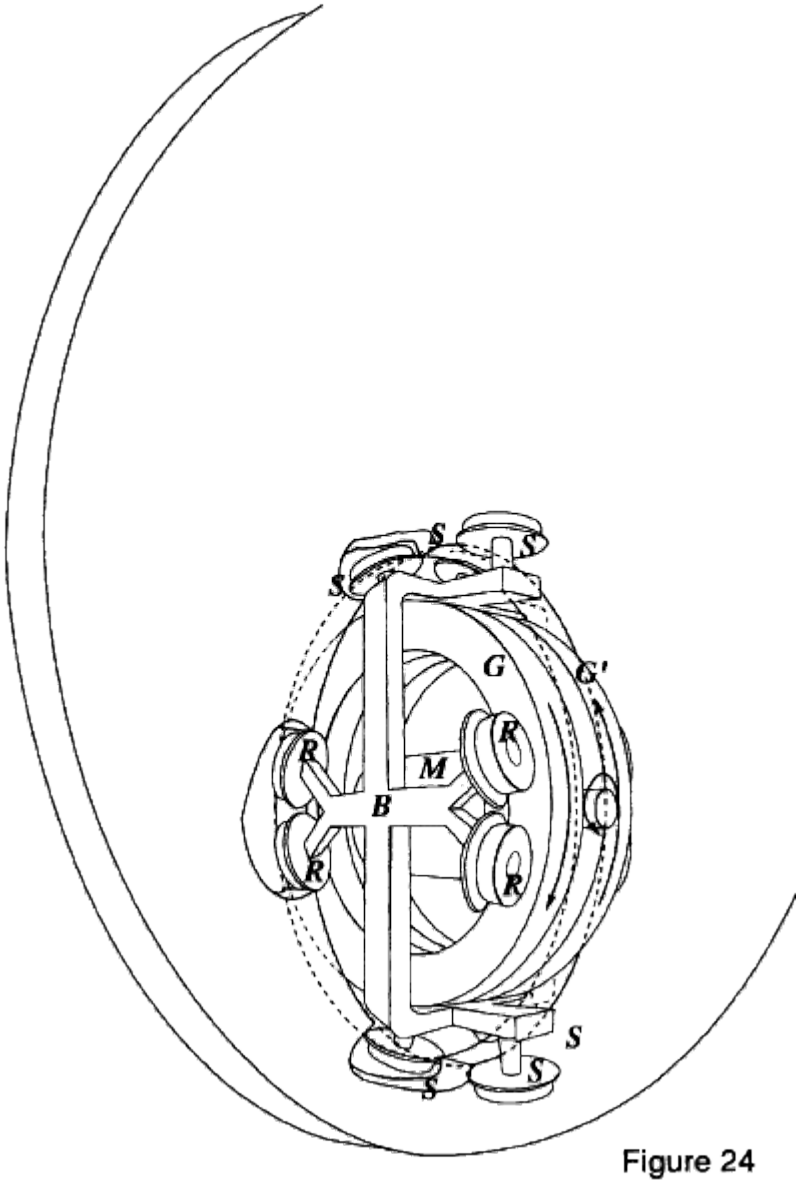


Figure 24

FIG. 25 and **FIG. 26** indicate two arrangements of FIG. 24 so as to eliminate net torque on the vehicle.

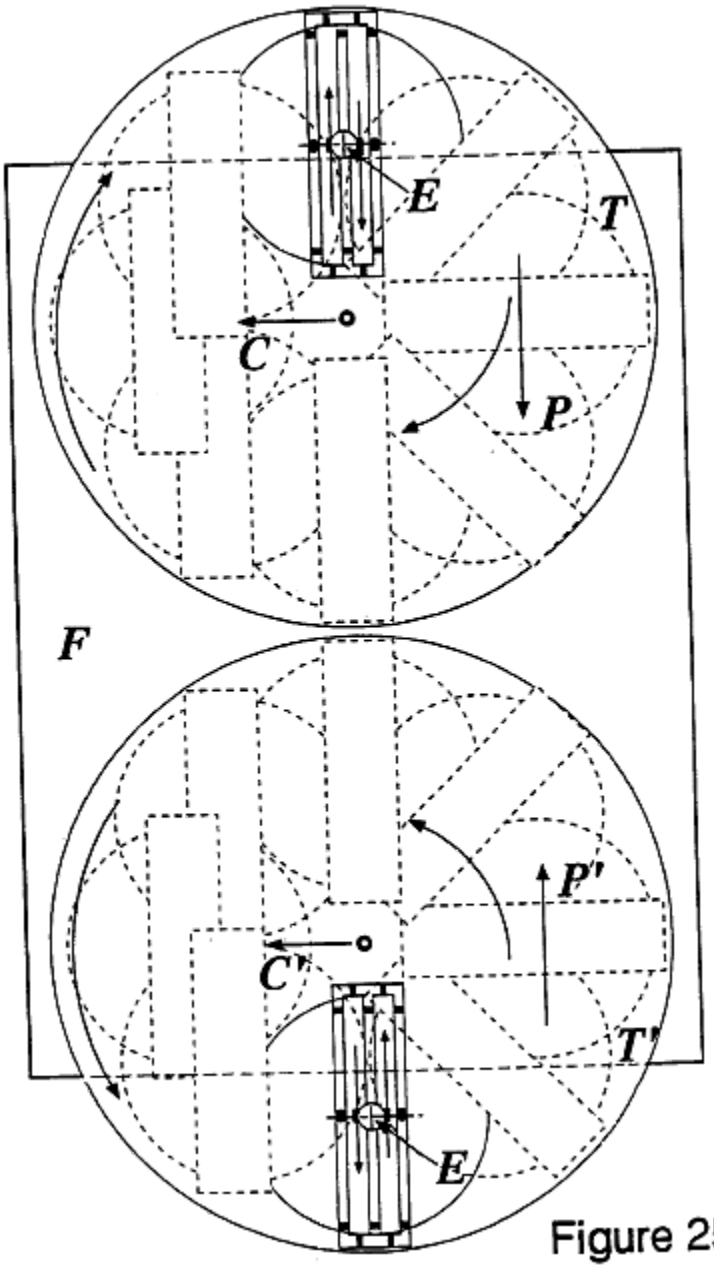


Figure 25

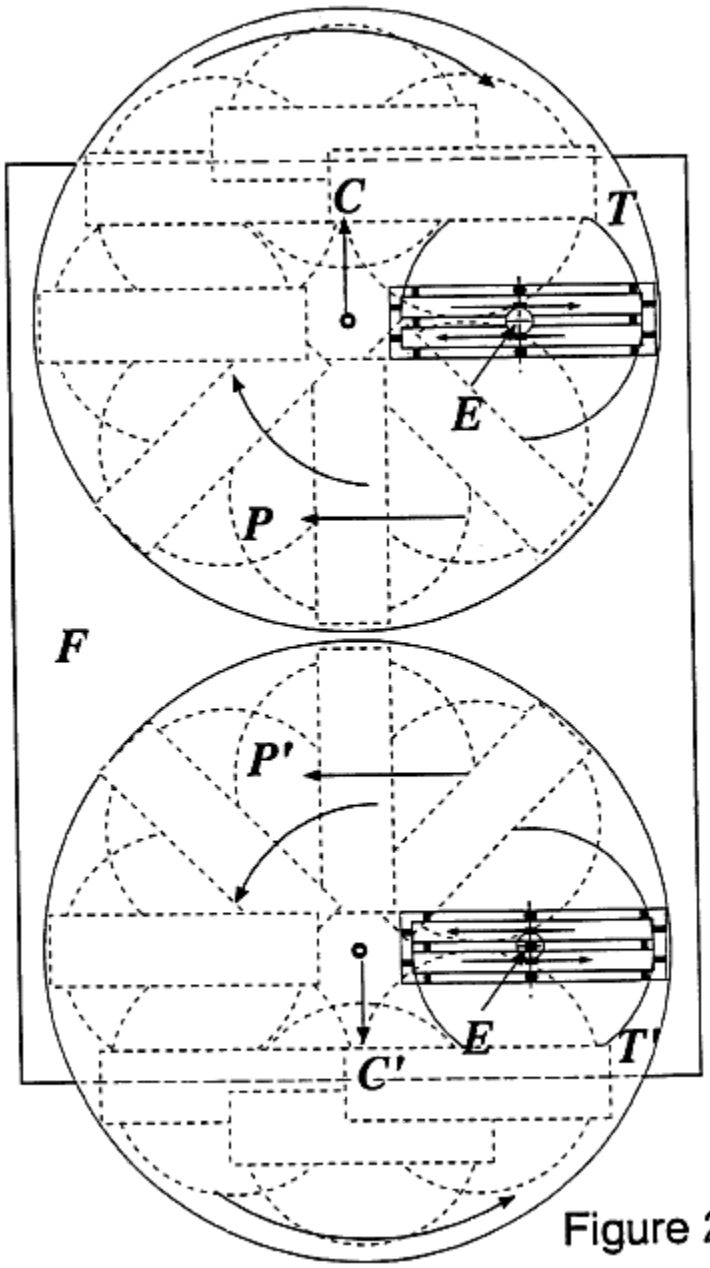


Figure 26

FIG. 27 and **FIG. 28** further illustrate the limiting alternative attitude of the fifth embodiment with respect to the fourth embodiment.

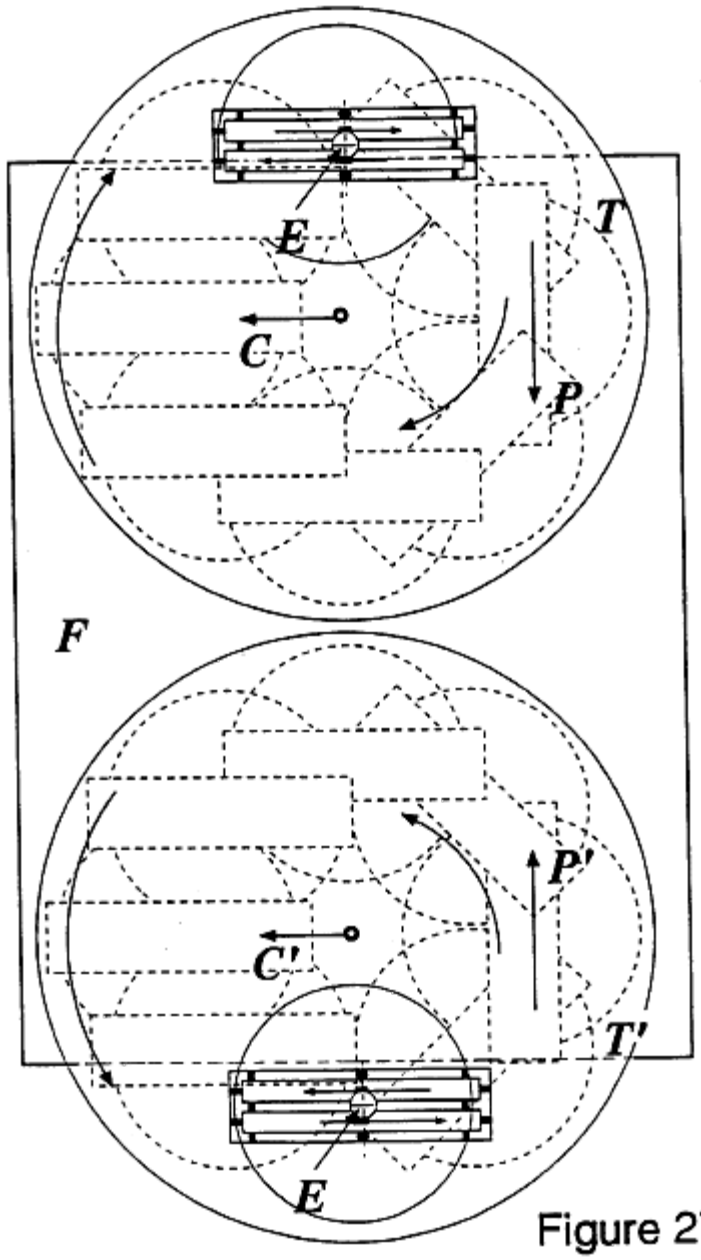


Figure 27

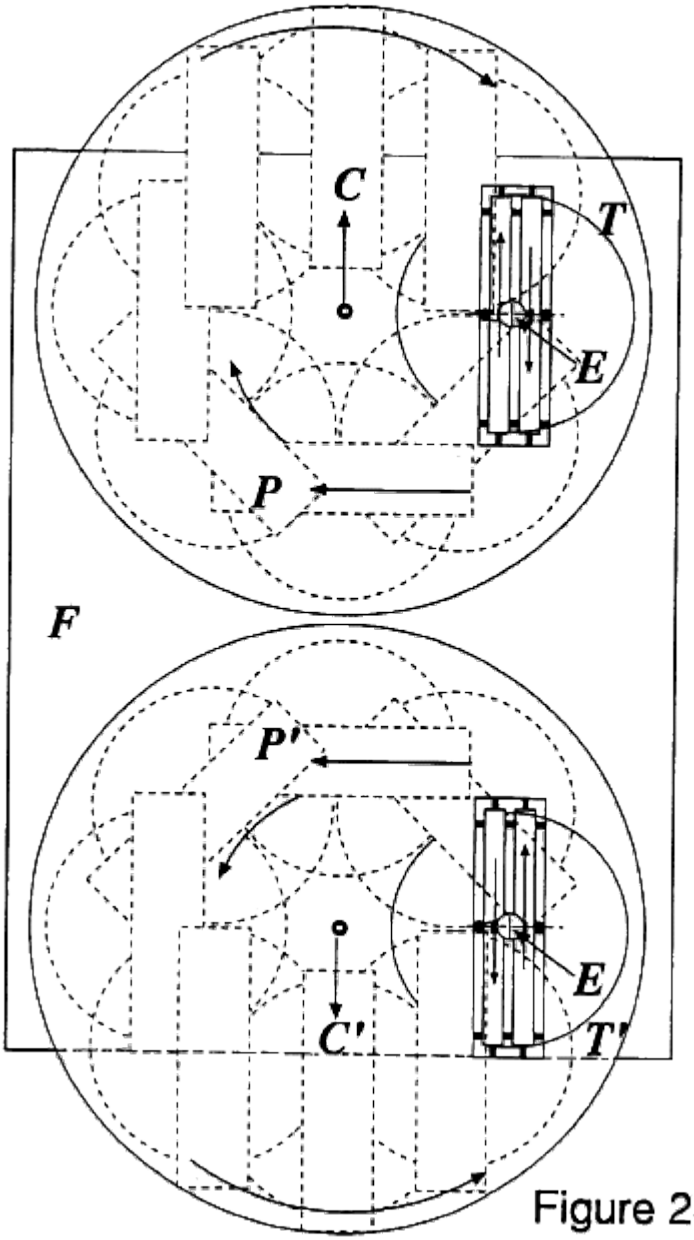


Figure 28

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. 10, which shows one of the four gyroscope units of the first embodiment of the present invention, each gyroscope unit comprises a horizontal base plate (30), a cradle means (32,34), which cradle means supports a translatable shaft (22) and enables the rotation of that shaft about a vertical axis AA which passes through the centre of the shaft and a horizontal axis BB which also passes through the centre of the shaft and intersects the axis AA. The shaft (22) in turn carries a gyroscope (23) which is fixed against movement along the shaft but is free to rotate around the shaft.

The base plate 30 is arranged to be secured to the vehicle to be propelled by the system.

In more detail, the cradle (32,34) comprises an outer U-shaped member (32) which is connected to the base plate (30) by a pivot (31) which enables the outer U-shaped member (32) to rotate about the vertical axis AA. The outer member (32) is formed by a substantially horizontal central section (41) which has an arm (42,43) depending vertically from each of its ends. Each of these arms (42,43) carries a pivot (35) which is disposed on the axis BB.

The inner member (34) of the cradle is formed from a relatively long U shaped member (21) and a pair of side arms which extend perpendicularly outwardly from the long member at a position half way along its length. The long member consists of a substantially horizontal section (46) from either end of which an arm (47,48) extends vertically upwardly. Likewise each of the side arms (44) has a part extending vertically upwardly (50,51) from its end. Each of the arms (47,48) extending vertically upwardly from the ends of the long member (21) carries a rectangularly shaped bearing (24,25) towards its upper end. Each of the vertically depending arms (50,51) on the side arms defines a recess which is engaged by the respective pivot (35) on the outer cradle member (32). When each of the horizontal sections (41,46) of the inner and outer cradle members (32,34) are in a horizontal position then the centre of the bearings (24,25) which define the axis `CC` are positioned to be at the same height as the pivots (35) so that the axis `CC` intersects the axes `AA` and `AB`.

A shaft (22) of substantially regular rectangular cross-section and of a length slightly greater than twice the distance between the bearings (24,25) is held by the two bearings (24,25). Each of these bearings is configured so as to prevent rotation of the shaft relative to the inner member (34) but to allow it to be linearly translated through the bearings. A rack (29) is cut into one side of the shaft and extends along the shaft by a distance substantially equal to the distance between the two bearings (24,25). A motorised bearing (27) is fixedly attached to the shaft (22) at its mid point which lies between the two bearings (24,25). A gyroscope (23) is in turn carried by this motorised bearing.

Finally, the means for translating the shaft is provided by a motor (26) which is supported by the inner cradle member (34). The motor (26) drives a spur gear (28) which engages with the rack (29) on one side of the shaft (22).

To enable the gyroscope unit to be operated outside a gravitational field a means is provided for exerting a torque about the pivot (35). This torque providing means consists of a solenoid actuator (36) which is attached to the upright arm (42) by a pivoted clamp (37). The solenoid (36) actuates a rod (39) which in turn acts on a connector (40) which in turn engages the upright member (51) of the inner part of the cradle (34).

It will be appreciated by those skilled in the art that power must be supplied to the torque providing means (36), the actuating motor (26) and the motorized bearing (27). A person skilled in the art will be able to envisage a number of ways of supplying this power to the apparatus.

In order for the means (36) to exert a torque on the gyroscope (23) it will be necessary to supply a torque which prevents the vehicle (with the base plate (30) and outer cradle member (32)) rotating around the pivot (35). This may be achieved by securing an identical gyroscope unit to the vehicle and it to precess about the axis AA in the same direction as the above described first gyroscope unit but with the gyroscope in the second unit spinning in the opposite direction to the gyroscope in the first unit. For example, the inner cradle of the second unit may also be fixedly attached to the base plate (30) whereby the torques on that base plate owing to the precession of the two gyroscopes cancel.

Alternatively, in a terrestrial application of the first embodiment, the required torque may be provided by the weight of the gyroscope, in combination with an equal and opposite reaction provided through the vehicle to the base plate (30).

It will further be appreciated that it will not be possible to supply each of the gyroscopes of the first and second gyroscope units with the requisite momentum along their precessional path without imparting an equal and opposite momentum to the vehicle. The requisite momentum for the precession of the first gyroscope unit may be obtained from a third gyroscope unit identical to the first unit and in which the pivots (35) of that unit also lie along the axis BB. The gyroscope of that third unit may be set spinning in the same direction as the gyroscope (23) of the first unit and caused to precess in the opposite direction to the gyroscope of the first unit, whereby the net linear momentum required to launch the first and third gyroscopes would be zero. In order to provide the torque required for the precession of the third gyroscope unit a fourth gyroscope unit may be provided which precesses about the same axis as the third gyroscope unit and in the same direction as the third gyroscope unit but with the gyroscope of the fourth unit spinning in the opposite direction to the gyroscope of the third unit. Furthermore, the fourth unit supplies the requisite launch momentum for the second gyroscope.

Since the gyroscopes of the first and third gyroscope units are spinning in the opposite direction to the gyroscopes of the second and fourth gyroscope units then it will be seen that the torques required to start the gyroscopes spinning are also cancelled in the above arrangement. Hence, no net torque is exerted on the vehicle.

It is to be appreciated that in terrestrial applications, some or all of the required torque and linear momentum may be provided by the medium through which the vehicle is travelling, or the surface over which the vehicle is travelling. For example, the torque may be provided by reaction against rails along which the vehicle is travelling, or, in the case of a boat, by reaction between the keel and the water.

Preferably, however, the torques and linear momenta will also be balanced in a propulsion apparatus for terrestrial use. For example, in the case of a propulsion system for a boat this has the further advantage that the water is less disturbed and quieter propulsion results.

The cycle of operations of the first embodiment of this invention is shown in FIG. 11. For simplicity only the ends (47,48) of the inner cradle (34), the gyroscope (23), with the direction of spin of gyroscope (23) indicated by the arrow, and the motor (26) of the first gyroscope unit are drawn. At `A` a torque is applied to gyroscope (23) and the system is allowed to precess to `B` where the torque is removed. The motor (26) now operates and attempts to return the assembly to its previous position in space but because the gyroscope (23) is massive with respect to the remainder of the system the supports move rather than the gyroscope (23) as shown at `C`. The gyroscope (23) is again caused to precess to `D` as previously, the torque once more removed and the motor reversed. The supports again move further than the gyroscope (23) as shown at `E` and the whole system has been caused to translate a distance `S`. The system will be seen to be in the same position as at `A` and the whole cycle may be repeated.

It will be realised that the operations of the other three gyroscope units may be carried out in synchronism with the operation of the first gyroscope unit such that each of the gyroscopes will be translated in the same direction at the same time.

In order to reduce the step like nature of the movement of the vehicle being propelled a number of other groups of four gyroscopes may be provided. It will be understood that each of these may be operated serially so as to provide a steady succession of movement to the vehicle and thereby smooth the propulsion of the vehicle.

Another method of smoothing the propulsion of the vehicle is to combine the translational and precessional part of the gyroscope cycle into a single compound motion so as to allow the proportion of translational and precessional motion to vary smoothly throughout that cycle. The second embodiment of this invention is an example of an apparatus which achieves this.

Referring now to FIG. 12, the apparatus of the second embodiment consists of three principal parts. The first of these is a means for rotating the direction of the spin axis CC of a gyroscope (60) about a perpendicular axis AA which intersects the axis CC, the second of which is a means for causing the centre of the gyroscope to follow a circular path about an axis BB which is parallel to the axis AA and displaced therefrom by distance D, and the third of which is a means (80,81) for rotating the gyroscope (60) about its own spin axis CC.

The means for rotating the direction of the spin axis of the gyroscope about the first axis AA comprises a horizontal bar (63) rotatably driven about the axis AA by a shaft (62) which is in turn connected to a motor (not shown). The bar (63) has two arms (64,65) which depend vertically downwardly from each end of the bar (63). A horizontal shaft (61) is carried between the arms (64,65). The gyroscope (60) is rotatably and slidably supported on the shaft (61) at a point intermediate the two downwardly depending arms (64,65). In this way the direction of the spin axis CC of the gyroscope is constrained without dictating the position of the gyroscope along the shaft (61).

The means for causing the centre of the gyroscope to follow a circular path about the parallel axis BB comprises a lower shaft (75) which pivotally supports a substantially horizontal second bar (70) which is thereby rotated about the axis BB, (which axis passes through a first end of the bar (70)), by a motor (not shown) at an angular velocity which is twice that of the angular velocity of the rotation of the upper bar (63). A vertical shaft (76) is pivotably supported at the opposite end of the bar (70) at a distance D from its first end and is fixedly attached to the base of a substantially U-shaped member shown generally at 71. The U-shaped member (71) comprises a horizontal base part which has two upwardly extending arms (72,73) at its ends, each of these arms having a bearing through which the shaft (61) passes. These bearings support the shaft (61) on either side of the gyroscope (60), sleeves (77,78) being provided around the shaft (61) to maintain the position of the gyroscope between the two upwardly extending arms (72,73). Each of these sleeves is preferably of an equal length, thereby positioning the centre of the gyroscope (60) directly above the axis of that shaft (76). In this way the centre of the gyroscope (60) is constrained to follow a circle centred on the vertical axis BB and of radius D, where the distance D is smaller than one quarter of the distance between the downwardly depending arms (64,65) less one half the external distance between the upwardly extending arms (72,73).

The means for rotating the gyroscope about its own spin axis comprises a motorized bearing (not shown) similar to that described in relation to the first embodiment. Those skilled in the art will be able to envisage a number of ways in which the required power can be supplied to the motor.

Each of the shaft (62) and the lower shaft (75) is arranged to be attached to the vehicle to be propelled.

As with the first embodiment of the present invention, the torque developed or required in the precession of the gyroscopes may be obtained from another "mirror image" system so that the two torques cancel leaving no net torque on vehicle. Also, again as with the first embodiment of this invention, any resulting uncancelled forces may be provided by another gyroscope unit. In practice therefore several gyroscope units may be employed together as shown in FIG. 14.

The operation of the unit of the second embodiment of the invention will now be described with reference to FIG. 13. The rotation of bar (63) about axis `AA` is at half the rate of rotation of the arm (70). When these two motions are combined the motion of the gyroscope is substantially that depicted in FIG. 13, which shows the sequential positions of the gyroscope for one half turn of the bar (63). It will be seen that the gyroscope moves from one end of the shaft (61) to the opposite end of the shaft (61) in the same period as the shaft is rotated by 180.degree.. The way the gyroscope is depicted in FIG. 12 corresponds approximately to position (H) in FIG. 13.

Before bar (63) completes a whole turn the gyroscope has to make a second complete path about its locus but during the second turn the direction of spin of the gyroscope is opposite to the direction in which it was spinning on the previous turn. The direction of torque demanded by, or that must be applied to, the gyroscope has therefore to be reversed each time the gyroscope passes position (E) in FIG. 13.

From FIG. 13 it will be seen that the motion of the gyroscope is essentially in two parts; first when it is undergoing substantially precessional motion between positions (H) and (B2) corresponding to position (B) but on the second revolution around the axis `BB` and second when it is undergoing substantially linear translation between positions (D) and (F). In both revolutions the direction of linear translation is in the same direction and will tend to impart a linear cycle of momentum to the vehicle while the motion between positions (H) and (B2), being substantially precessional, develops significantly less momentum.

Combined in the manner described it is possible to provide a cyclic pulse of momentum in the opposite direction to the linear direction of translation of the gyroscope, and provide a smoother propulsion than is provided by an apparatus such as the first embodiment, in which the motion of the gyroscope may be divided into a purely precessional part and a purely translational part.

Just as in an electric circuit, a voltage applied across a resistor causes a current to flow in that resistor, so equally a current of that value being passed through that same resistor will cause a voltage to appear across it, so a torque may be seen as the cause of a precession or conversely that precession may be seen as the cause of a torque. This is of especial significance with respect to the third embodiment of the invention.

Generally, the operation of the gyroscope unit of the third embodiment will now be explained with reference to FIG. 15. In that Figure, a gyroscope (M) is precessed around a horizontal circle, the torque on the gyroscope being provided along a radius of that circle, and the axis of spin of the gyroscope at all times being tangential to that circle, the wheel subsequently being returned along a path which lies in the plane of the wheel.

The operation of the third embodiment of the present invention can be understood by considering the arrangement of FIG. 15 in a situation of zero gravity and ignoring, for the present, the fact that any torque in one direction is only produced as the result of an equal torque in the opposite direction. In operation, the torque motor twists the shaft (R) which causes the wheel (M) to precess from A to B in a horizontal plane. This is a precessional stroke. At B the torque is removed and a second return motor, incorporated as part of the pivot (O), drives the shaft (R) in a downward semicircle, between the supporting plates (G, G'), back to A. This is a reaction stroke. If, instead of being precessed from A to B by an applied torque, the wheel were forced round the same path, the torque motor being removed so that the solid shaft were not interrupted, then the wheel would help itself to the amount of torque required to maintain that rate of precession, from the bearings at the pivot (O).

The gyroscope unit of the third embodiment of the present invention is shown in FIG. 16. The unit has a horizontal base plate which rotatably supports a horizontal turntable which is free to

rotate about a vertical axis through its centre. A motor is provided to rotate the turntable relative to the base. A pair of parallel-spaced substantially triangular plates extend vertically upwardly from the turntable. A horizontal lower bevelled gear is disposed directly above the centre of the turntable and is carried in between the two upwardly extending plates. The lower bevelled gear is fixed against rotation relative to the base plate. An upper vertical bevelled gear is pivotally mounted between the uppermost ends of the upwardly extending plate. The upper bevelled gear and lower bevelled gear are of equal size and are arranged to mesh with one another. A pendulum shaft is carried in plane parallel to the two upwardly extending plates by the upper bevelled gear. The free end of the pendulum shaft is provided with a fork which is arranged to rotatably support the gyroscope wheel.

The bevel gears of the third embodiment enable the precession and reaction strokes to be geared together, such that, for rotation of the support plates (G, G') fixed to turntable (J) with respect to the baseplate (H), the shaft (R) carrying the wheel is rotated by the same amount, using the bevel gears (at O) in place of the return motor shown in FIG. 15. Hence, the gyroscope unit of the third embodiment of the present invention is driven by a single motor so that for every 180.degree. of precession in the horizontal plane it performs 180.degree. of reactive rotation in the vertical plane.

The resultant motion may now be seen to take place entirely within the space ABCDEFGH of the theoretical circumscribing box and, as above in FIG. 16, never enters the other half of the box at all.

Looking in plan, i.e. downward on plane ABCD, the motion of the wheel is seen to be as in FIG. 18. In the parts of the path in the lowermost half of that Figure, precession dominates and mass transfer is taking place, whereas, in the parts of the path in the uppermost half non-precession dominates and a reaction force is developed.

FIG. 19 shows the elevation as viewed into plane ABFE for a full 360.degree. of rotation the turntable. The torque demanded at the centre point is seen to alternate between one half rotation and the next.

FIG. 20 shows the elevation as viewed into plane ADHE. In addition to the alternating torque required, there are seen to be alternating reaction forces parallel to AE and BF which do not therefore contribute to propulsion of the vehicle.

These forces along with the torque which has to be provided by the base (H) may be cancelled out by additional similar arrangements in mirror image.

On the other hand, FIG. 19 shows that the forces parallel to AB and EF do not cancel but instead combine to drive the base in one direction. The cancellation on one axis and supplementation on another at right angles to it is a fundamental property of three dimensional space and is also exemplified by the use of the left and right hand rules of electromagnetic theory.

In order to cancel the actual torque developed in driving the wheel on the turntable (J) round the baseplate (H) an identical turntable may be mounted alongside on the same baseplate with the second wheel occupying the space DCJIHGKL (allowing such additional space as might be required for clearance). The two wheels spin in the same direction when adjacent but are driven in mirror image paths by equal and opposite torques from the same motor resulting in no net torque on the vehicle.

Similarly this pair of wheels develop a net torque in the plane DCGH against the baseplate which may be cancelled by another pair of identical wheels mounted immediately beneath the first pair, again as a mirror image of them. The four wheels may then be driven by a single motor so

mounted that it is free to rotate on baseplate (H) and all its power is absorbed by the losses in one pair of wheels being exactly equal to the losses in the second pair while the sum of these losses is supplied by the motor(s) typically though not exclusively when the gyroscope units illustrated in FIG. 16 are arranged together as in FIG. 17.

In the fourth embodiment of the invention FIG. 21 shows a frame F on which is mounted a turntable T capable of being rotated with respect to F by a motor M. A motorised gyroscopic means G, which may be similar to that described in relation to FIG. 10 below, is rigidly mounted in a carrier B. This carrier is located by flanged wheels S in turntable T so hat it is free to rotate about an axis E normal to the plane of the turntable but will be carried round by the turntable. The axis E is substantially at right angles to the axis of rotation of the gyroscopic means G. An actuator A is fitted in such a manner as to be able to operate a clamp C and prevent the free rotation of the gyroscopic means and its carrier with respect to the turntable.

In operation, the gyroscopic means is first supplied with power and allowed to reach its designed operating rotational speed. The motor M is energised causing the turntable to rotate. At .PI. the actuator is activated clamping the frame B to the turntable and causing the gyroscopic means thereby to be forcibly precessed through an arc of 180.degree.. At 2.PI. the actuator is released so that the frame B is free to rotate while the turntable continues turning a further 180.degree. back to .PI. without stopping. The actuator is again energised and the cycle repeated.

During the first half of the cycle just described the force acting upon the gyroscopic means to maintain it in the prescribed arc is less than that calculated were the gyroscope means a simple non rotating object of the same mass. During the second half of the cycle the full calculated force is required. Thus the relative movement of the effective centre of mass of the whole apparatus with respect to the frame F takes place with a fraction of the reaction upon the frame during the first half cycle F compared to the reaction upon the frame during the second half cycle, resulting in an overall transfer of mass in direction P.

In practice the torque developed by the gyroscopic means on the carrier B has to be provided by an identical inverted turntable complete with an identical counter rotating gyroscopic means, carrier, actuator and clamp, both turntables driven by the same motor. The net torque required to maintain rotation of the turntables as just described and the angular momentum developed when the carrier(s) B are clamped is supplied from an identical mirror image pair of turntables such as the arrangement illustrated in FIG. 22. Such an apparatus as illustrated in FIGS. 21 and 22 or those described in the following FIGS. 23 to 28 inclusive are not necessarily limited to one gyroscopic means per turntable and a number of such gyroscopic means might be attached symmetrically to each turntable provided that the arrangement is repeated for reflecting and balancing turntables.

For clarity, each gyroscopic means thus far described has been considered to consist of a simple, single, motorised bearing with a massive outer rim. However, if the mass of the rotating part of each gyroscopic means is concentrated in a `thin` rim, to the extend indeed that the entire centre of the gyroscopic means were absent, the theoretical gyroscopic effectiveness of such mass would be increased. If an identical rim, revolving in the opposite direction, be mounted alongside the first rim, the torque required to cause one rim to precess would always balance that required by the second rim. Furthermore the forces required to develop this torque are provided at either end of a diameter where they are needed and not through the shafts, hubs and webs, thereby concentrating the highly stressed sections to two compact zones with reduced risk and lower weight penalty.

FIG. 23 is a simple perspective sketch of such an arrangement where G and G' are the two rim-only gyroscopic means, M is a common motor driving both rims and mounted within the enveloping carrier B to which are fixed a series of rotating supports R that locate the rims. The carrier B is here shown with flanged wheels S to mount this unit into a turntable as described in the fourth embodiment and illustrated in FIG. 24.

FIGS. 25 and 26 show two arrangements of the fifth and fourth embodiments so combined as to illustrate that mass transfer may be derived from the difference in centrifugal force between rapidly spinning masses being precessed and being swung round an arc without precession as firstly

a) in FIG. 25 by arranging for the effective mass transfer P and P' of two identical counter rotating systems to cancel and combining the effective difference of resultant centrifugal forces C and C' or as secondly b) in FIG. 26 by summing the effective mass transfer P and P' and arranging for the effective centrifugal forces C and C' to cancel.

FIGS. 27 and 28 show the fifth embodiment combined with the fourth embodiment turned through 90.degree.0 at the start of the cycle to indicate that the claim to mass transfer does not rely in particular to the relative angle the fifth embodiment may have with respect to the fourth embodiment at the commencement of a cycle provided that an arc of precession of approximately 180.degree. is followed by a further arc of 180.degree. without precession whereby the transfer of the mass of the gyroscopic means is transmitted to the vehicle.

In other words, the purpose of FIGS. 27 and 28 is to clarify the claim that mass transfer is achieved is not limited to any one initial attitude of the fifth embodiment with respect to the fourth embodiment but may apply to any attitude provided that the axis E is substantially normal to the plane of mass transfer and, by definition, is substantially parallel to the axis of precession.

Notwithstanding the use of `single gyroscopic means` being described in each of the preceding three other embodiments of the invention, the `twin gyroscopic means` of the fourth embodiment may be substituted for the appropriate pairs of single gyroscopic means in each of the former embodiments.

It will be seen how the present invention provides a propulsion system which does not necessitate the carriage of volatile fuel and which need not accelerate the vehicle in a conventional sense since it ceases to move the vehicle when it is inactive. Furthermore, it will be seen how the propulsion system may be powered by a renewable energy source such as stellar radiation or may be powered by a deliberately focused distant energy source such as a microwave power beam.

"Laithwaite's Amazing Invention"

(Unidentified magazine, Jan. 2, 1975)

Professor Eric Laithwaite, of the Imperial College of Science and Technology, England, has invented an anti-gravity machine! Such a device has been the tool of science fiction writers and the dream of thinkers such as H.G. Wells and Jules Verne, but until now e everyone had dismissed the idea as an impossibility.

Now Professor Laithwaite, who is already famous for inventing the linear induction motor, has demonstrated that his machine actually works. When switched on it reduces its weight!

If the machine is truly functional it must be but a short step to building a machine that will reduce its weight so much that it will simply float away.

The professor insists that he has discovered a principle that will solve the problems of interstellar flight. “With just a cupful of uranium we could reach the nearest star”, he says.

The professor’s prototype antigravity machine was demonstrated to the historic Royal Institution recently. He placed it on a pair of kitchen scales to prove that it does reduce its weight when in action.

Opinions vary whether or not it did are sharply divided. A disclaimer appeared in the prestigious New Scientist magazine soon after. The good professor explained patiently to us that the writer had no idea of what he had demonstrated and did not understand the principles involved.

The machine itself consists of a central upright rod which is spun by means of an electric motor at its base. Towards the top of the rod two smaller rods connect laterally. On the end of each is a brass gyroscope.

When these gyroscopes are spun with a blast of compressed air their movement causes the hinged rods to rise and revolve around the main spindle. This revolution is aided by the electric motor.

A curved rail counteracts their tendency to rise and forces them down again. The reaction to this provides the thrust for lifting, as the cycle repeats itself again and again.

The professor insists that he has no quarrel with Newtonian laws of motion, although many claims have been made by less well-informed commentators that he has. “But I do think Newton’s laws need modifying”, he comments.

Newton, it seems, rather overlooked the problems of gyroscopes and their tendency to do unexpected things. Laithwaite contends that Newton’s laws of motion should be modified to account for gyroscopic precessions.

The secret of his anti-gravity machine lies in the fact that no energy is required to return the gyroscope arms to their starting positions --- gyroscopes do that naturally as they precess.

It’s a difficult problem to explain the workings of the machine. Only time will tell us, the general public, if the professor has done his homework properly.

The scientist himself intends to demonstrate that he has indeed found a new kind of "inertial drive". "By 1976", he says, "I intend to lift a man off the floor of the Royal Institution".

Finally it should be known that the professor is no "crackpot" inventor. He has the following degrees: BSc., MSc., PhD., DSc., and has won international honors for his engineering achievements.

New Scientist **(14 Nov. 1974)**

"Eric Laithwaite Defies Newton"

Robert Walgate

The Professor of Heavy Electrical Engineering at Imperial College London, Eric Laithwaite, highly successful inventor of the linear motor, has entered the sacrosanct domain of the mechanical engineers. And he says "they need me". Last Friday as the piece de resistance of his evening discourse at the Royal Institution he demonstrated a machine that, he claimed, violated gravity and produced lift without any external reaction.

The machine is pictured here in action on a kitchen spring balance, just as he demonstrated it. The machine uses two precessing tops whose precession (slow motion of the axis of rotation about a vertical axis under the action of gravity) is assisted by the motor at the bottom. This makes the tops rise. The tops are restrained from rising by a track like a big dipper, and as the tops follow the track the whole machine jogs up and down. Professor Laithwaite contends that there is more jog up than jog down.

Laithwaite began his discourse with a series of entertainments from his work on electromagnetic levitation, draing applause and laughter from his evening dressed audience like a good juggler, and throwing in his usual flamboyant claims. All this was to prove Don Quixote's phrase "all things are possible". Then he moved into h=gyros (mmore exactly, tops).

Tops are certainly fascinating. They fascinated the Victorians and the Edwardians after them, and many a Newtonian treatise has been written about their motion. They are used with great precision in gyroscopes in ships, submarines, aeroplanes and rockets, so there must be some understanding of their motion. But Laithwaite contended that the familiar precessing top that can be bought in the toyshop, being of a different design (not supported through its center of gravity), is not properly described by Newton's laws of motion.

He drew the curtain covering the blackboard to reveal a modification of Newton's second law (in an inertial frame) that bears the same relation to the usual equation as does the equation for the voltage on a resistance, capacitance and inductance to Ohm's law.

In practical terms he had four main contentions about gyroscopic precession. First, he believes that the angular momentum of precession (about a vertical axis) is created out of nothing, so that angular momentum is not conserved about that axis in direct contradiction of Newton's mechanics; second, he believes the precession is not accompanied by any centrifugal force (the force you feel if you swing a bucket around in the garden); third, he contended that it requires no force to stop the precession; and fourth that if the precession is speeded up, the tops (which certainly rise) do so without there being any consequent downward reaction.

It is my opinion that none of these contentions was proved by the experiments Laithwaite performed at the Royal Institution during his discourse. Perhaps he will be able to do more precise experiments which will bear him out, but until he does so his case remains at least unproven. To take just one example --- and the most spectacular --- his anti-gravity machine weighed to within half a pound of the upper limit of the scales (where there was a mechanical stop). So even if the reaction on the scales was reduced during one part of the machine's cycle (and it indeed went down 5 pounds out of its total 20), the reaction would not have shown on the scales if it had gone above 20 pounds on the least of the cycle. The needle in fact swung violently between its upper limit and 15 pounds.

You have probably got the impression by now that I am skeptical of Eric Laithwaite's views on the gyro. You would be right. I believe he has got it wrong by changing fields too quickly and jumping to conclusions --- or else we are all being taken for a marvelous ride! Yet he said in his discourse that his "life had led up to this moment", and he appeared to be extremely serious about his views.

If indeed he is not joking he is beginning to bear a strong and sad resemblance to one of his heroes, Don Quixote. A giant (figuratively and physically), he is gentle (he is an expert on butterflies) and has all Don Quixote's lovable but arrogant naivity. This time he has tilted at windmills.

Newton's Point of View

Newton, though long dead, can still give us his views through his equations of motion. The first point he might make about Laithwaite's experiments is that they involved "fast" tops. These are tops that have far more kinetic energy in the gravitational field (weight times distance the center of gravity of the top can move). Such tops have a deceptively simple motion that can confuse generalization to slow tops.

One example of this is the question of the "creation" of angular momentum about a vertical axis when the top begins to precess. In fact the top, when released from a stationary horizontal position, falls vertically until has a component of its own high internal angular momentum along the vertical --- just enough to compensate for the angular moentum of precession. This fall (which indetail is a damped out nutation) is hardly noticeable in a fast top but is obvious in a slow one. Hence the creation of the angular momentum of precession.

A similar remark applies to the centrifugal force of precession; if a top is fast the centrifugal force is only a small fraction of the weight of the top, so it is hardly noticeable. For a slow top the force becomes more important as the precession speeds up, and this is one of the contributions to the falling over of a toy top on its support as it slows down.

Next, according to our old friend Newton, a force is certainly needed to stop a precessing top, albeit a small one. The exact motion of the top after it has been stopped depends on the details of its previous motion. So in both the case of the centrifugal force and stopping the precession there is a simple test by which Newton's and Laithwaite's contentions can be distinguished.

Finally there is the question of the reactionless rise of an assisted, precessing top. Laithwaite agrees that the exact amount of energy needed to lift the top must be introduced by twisting its vertical support, so there is no gaining something for nothing on that score. Newton would argue that no vertical reaction was necessary anyway once the top started upwards (just as no extra reaction is necessary on a crane when it is steadily lifting its load). And to test the contention that the machine gets lighter, Newton would ask Laithwaite to measure the impulse (force times time of action), not the force itself. Such sophistication is beyond a set of kitchen scales.

Bibliography

Laithwaite, Eric R.: "The Bigger They Are, The Harder They Fall"; Electrical Review 196 # 6 (14 Feb., 1975), pp.188-189

Laitwaite, E.: "1975 --- A Space Odyssey"; Electrical Review 196 # 12/13 (29 March/4 April 1975), pp. 398-400

"The Continuing Story of Gyroscope Magic"; Electrical Review 197, pp. 675-676

"Roll Isaac, Roll" (Pt. 1) Electrical Review, 204 # 7 (16 Feb. 1979), pp. 38-39, 41; ibid., (Pt. 2), Vol. 204 # 11 (16 March 1979), pp. 31-33

"Propulsion by Gyro"; Space, Vol. 5 (Sept.-Oct. 1989), pp. 36-39;

Bova, Ben: "None So Blind"; Analog (June 1975), pp. 5-6, 8, 176

Coates, R.: "Professor Laithwaite & Gyroscopes"; Electrical Review 196 (1975): 506-507

"I Will Not Roll Yet, Isaac Newton"; Electrical Review 205 # 15 (19 Oct. 1979), pp. 43-44

Walgate, Robert: "Eric Laithwaite Defies Newton"; New Scientist (14 Nov., 1974), p. 470; ibid., (28 Nov., 1974), p. 679; ibid.,
(19 Dec., 1974), p. 895; ibid., 9 Jan., 1975), p. 97; ibid., (6 Feb., 1975), p. 341; ibid., (13 Feb

1975), p. 407; ibid.,
(13 Mar., 1975), p. 669.

Veljko MILKOVIC Two-Stage Oscillator

Two-Stage Mechanical Oscillations Research Lab
Bulevar cara Lazara 56
21000 Novi Sad
Serbia

e-mail: milkovic@neobee.net
http://www.veljkomilkovic.com
Phone:
+381 21 6366 487
+381 64 153 20 72 (*Contact for all questions, business proposals, cooperation suggestions and calls from abroad)

A simple mechanical system that produces 9:1 over-unity and antigravity

(The following information is adapted from V. Milkovic's website:
http://www.veljkomilkovic.com)

BIOGRAPHY

Veljko Milkovic was born in 1949 in Subotica (Serbia), and since 1952 he has been living in Novi Sad (Serbia), where he finished secondary school and studied History. Apart from being interested in past events, he is also a researcher, an inventor, an innovator and a writer. Furthermore, he works on futuristic projects. So far he has got around 110 inventions and has designed 36 approved patents, some of which have been in use for years. Moreover, he has received many domestic and international awards for his work spanning over many decades.

He invented a self-heating eco-house and a number of ecological innovations, which also have been in use for a long time. According to his drawings, many such eco-houses have been built in Novi Sad, Sombor, Zajecar, Ljig (Serbia)... He has taken part in about 30 scientific gatherings in the field of energetics and ecology as well as many projects concerning scientific research.

He is the president of the Department for ecological innovations and the organiser of the Exhibition of ecological innovations with VRELO Society from Novi Sad. He is also a member of the Association for the popularisation of science - Novi Sad.

Among various domestic and international awards, he has received November charter of the city of Novi Sad in 2002 for the remarkable contribution in the field of ecology and energetic as well as in 2002 a gold medal of Novi Sad fair for the invention hand water pump with pendulum.

He is very familiar with Petrovaradin fortress (city of Novi Sad, Serbia); he has been exploring it since 1960. In 1965 he managed to decipher orientation marks at the crossroads and establish the logic of subterranean labyrinth with "^", "Y" and "T" crossroads. This approach helps him to examine the 20km deep undergrounds of the fortress in a faster and safer manner.

His engineering and ecological projects inspired by Petrovaradin fortress are in practice: "Selfheating ecological house", "Mushroom garden and greenhouse with reflecting surfaces" (mushroom gardens for growing bukovace near Cenej and Petrovaradin, Serbia, were built), Project "Forests for food production" (in use on several locations in the province of Vojvodina, Serbia and Montenegro) and "Autonomous battery charger".

In 1975, librarian Srenko Drk hired him as a guide for less known parts of the fortress especially subterranean military galleries.

Novi Sad museum awarded him with the letter of thanks for the "ardent contribution in research of the Petrovaradin fortress".

In the late 70's, as a member of scientific and technical editorial board of the Cultural Center in Novi Sad, he organized and lectured at panels about Petrovaradin fortress. Some of the participants were an academician and a professor Bogdan Brukner and a professor Milan Vranic.

An idea of a modern sod house as a new way of living gave him élan to continue with researching subterranean galleries.

In 1983, Veljko Milkovic and Mr. Srenko Drk founded "The club of friends of Petrovaradin fortress" within "Vladimir Nazor" library in Petrovaradin (Serbia).

In 1997 he announced the book entitled "Mysteries of Petrovaradin fortress", which was published as a feuilleton, a script and a book. That was the first time that the gap in the literature about Petrovaradin fortress and its underground has been filled. It is interesting that many journalists and authors like Mr. Živko Markovic, a historian, claimed that subterranean military galleries represent the largest attraction in Petrovaradin.

In his numerous lectures and during short excursions he talked about dangers, but also about great tourist potential of Petrovaradin, Fruška Gora, Srem (Serbia) and the central part of the (river) Danube-basin.

During public appearances in previous years, Veljko Milkovic announced major archaeological discoveries from Palaeolithic age at the location of Petrovaradin fortress and in the central Danube basin. Experienced archaeologists stated that "it is beyond dreams" and that it was "absolutely unexpected"...

But it happened and it was confirmed by the latest archaeological discoveries from Palaeolithic age. In his numerous public appearances, Milkovic claimed that the central Danube basin is a cradle of prehistoric period, which was confirmed by the recent discoveries by European scientists. He is also in possession of a unique and unusual archaeological collection. He also gathered numerous minerals and fossils, from the Danube-basin, as well as remains of previous civilisations.

In his research study he worked hard on gravitation phenomenon and also on the improvement of anti-gravitational experiments and, connected to that, anti-gravitational operating systems.

In the last few years he has been working in the field of single and double mechanical oscillations, which represent a new source of widely, used energy, based on which he has 22 approved patents. His present aim is to explore and use practically the potentials of double oscillations and, in connection to that, a new source of energy based on inertial forces and gravitational potential.

Among other things in his experiments, he managed to get 12 times more output energy than input energy. In last 10 years, no one argumentatively disputed research and measurings carried out by Milkovic. Through such achievements, Veljko Milkovic laid the path for new challenges in physics in the 21st century, which could be the forerunner of the new great scientific revolution.

Milkovic is in possession of numerous prototypes and models (photo & video), as well as ideas for various machines and devices. Over the years, Milkovic received many positive comments and opinions relating to his research from domestic and foreign physicists, professors, academicians, engineers, researchers etc. It is more and more definite that Milkovic's inventions can be used for production of numerous practical devices, thus creating a range of new products which could help in improvement of overall economical situation and better the situation in society.

So far he has published the following books:

"*Solarne zemunice - dom budunosti*" ("Solar sod houses - the house of the future"), (1983),
"*Ekološke kue*" ("Ecological houses"), (1991 - printed in four unedited editions),
"*Šume za proizvodnju hrane - zamena za njive*" ("Forests for food production"), 1992 (translated into Esperanto the same year),
"*Ka antigravitaciji - kompaktna vozila*" ("Towards anti-gravitation compact vehicles"), (1994),
"*Antigravitacioni motor*" ("Anti-gravity motor"), (1996 - with translation into English),
"*Perpetuum mobile*" ("Perpetuum mobile"), (2001),
"*Petrovaradin kroz legendu i stvarnost*" ("Petrovaradin through legend and reality"), (2001),
"*Petrovaradin i Srem - misterija prošlostit*" ("Petrovaradin and Srem - mystery of the past"), (2003),
"*Svet misterija - novi pogledi*" ("The world of mysteries new views"), (2004),
"*Petrovaradinska tvrava - podzemlje i nadzemlje*" ("Petrovaradin fortress over and underground"), (2005) and
"*Novi turistiki potencijali*" ("New tourist potentials"), (2006).

Milkovic also published noticeable feuilletons and notes:

"Niskoenergetski život" ("Low-energy life"), 1996.
"Energetski potencijal re?nog zaliva" ("Energetic potential of the river bay") 1996.
"Prethodna civilizacija" ("Previous civilisation"), 1999.
"Misterije Petrovaradinske tvrave" ("Mysteries of Petrovaradin fortress"), 1999.
"Petrovaradinska tvrava izme?u legende i stvarnosti" ("Petrovaradin fortress between legend and reality"), 1999.
"Nestale civilizacije" ("Missing civilisations"), 2000.

His book have been accepted both in domestic and foreign prestigious libraries, such as the Library of Congress, Washington DC and his publications can be found in the British Library in London, Moscow Library and Library of Alexandria. His publication have also been quoted in many Internet encyclopaedias and other sources.

He also found the solution how to lessen the problem of the "endangered inventor" and needs to make his secret public. That is exactly what Veljko Milkovi? is doing by publishing his books and publications.

Books: http://www.veljkomilkovic.com/KnjigeEng.html#antigravitaciji

Contact:

Veljko Milkovic

Bulevar Cara Lazara 56
21000 Novi Sad
Serbia
Phone:
+381 21 6366 487
+381 64 153 20 72 (*Contact for all questions, business proposals, cooperation suggestions and calls from abroad)

e-mail : milkovic@neobee.net

Web : http://**www.veljkomilkovic.com**

HAND WATER PUMP WITH A PENDULUM
(Patent - YU 49002 B)

CONTINUOUS PUMPING OF WATER WITH A LITTLE FINGER

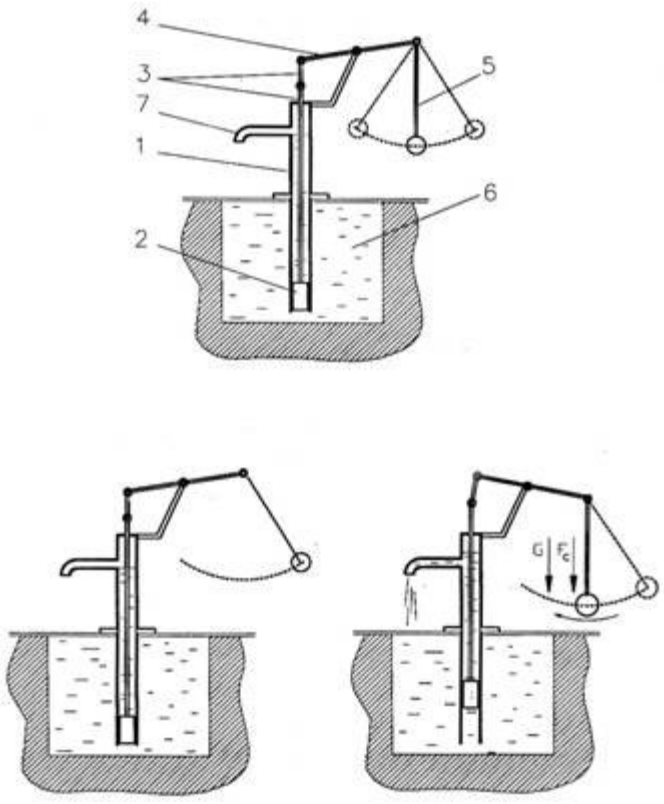
ENORMOUS EFFICIENCY CONCERNING THE INPUT OF ENERGY - UP TO A 1000 LITRES OF WATER PER HOUR WITHOUT A MAJOR EFFORT

Picture 1 --- Public presentation of the hand water pump with a pendulum during the Agricultural Fair in Novi Sad (Serbia), 2003. The invention won a gold medal during the 2002 fair.

New and technically original idea - hand water pump with a pendulum - provides alleviation of work, because it is enough to move the pendulum occasionally with a little finger to pump the water, instead of large swings. Using the minimum of human strength in comparison to present classic hand water pumps enables efficient application in irrigation of smaller lots, for water-wells and extinguishing fires even by old people and children, which was proved by a large number of interested future consumers during the presentations.

Hand water pump with a pendulum is a realisation of a new, original, and even unbelievable, by very simple solution for pumping water. Work is alleviated because easier, long-lasting and effortless use of the hand water pump has been enabled. Input energy for starting the process of pumping, in form of occasional pushing of the pendulum, is much less than with typical hand pumps.

Picture 2 ---Hand water pump with a pendulum for pumping water out from wells or reservoirs consists of a cylinder (1) with a piston (2), lever system (3), a seesaw (4), a pendulum (5), a reservoir (6) and output water pipe (7).



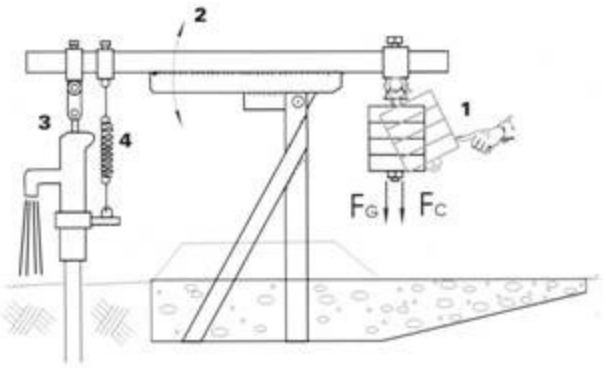
To get the water running out of the pump, the pendulum needs to be out of balance. After that, based on gravitational potential, the piston starts oscillating and the continuous stream of water is coming out of the output pipe. The pendulum should be occasionally pushed, to maintain the amplitude i.e. the stream of water.

The pump works well with all sizes of the pendulum, but mainly with the amplitude of 90°.

The advantage of this invention compared to present hand pump solutions are: less force to start the pump, less water consumption, both arms can be used to fetch the water.

The invention is applicable on other devices that use lever mechanisms, such as a hand press etc.

Picture 3 --- Side view of the pump and the position of the piston, lever and the pendulum during operation of the pump.



It is possible to pump out a 1000 litres of water per hour, without any fatigue and continue with the pumping. Both arms are free for fetching water, and both elderly and children can use it, since maintaining the oscillation of the pendulum does not request any special training or dexterity.

Whereas typical hand pumps require significant effort and an average person can use the pump continuously only for several minutes, the hand water pump needs the minimum of the effort, because it is only necessary to swing the pendulum and maintain the oscillation for several hours, without any fatigue.

All details on the hand water pump with a pendulum and the information can be provided by the author, Veljko Milkovic, who is willing for any form of cooperation with all potential strategic partners and customers for production and application. So far, there was a lot of interest for the application of the hand water pump with a pendulum both in domestic and foreign markets, as well as for further development of the product.

Experiments: 12:1 Over-Unity from 2-Stage Oscillators

During the last few years, Veljko Milkovic did several measurings, which showed the energetic excess, 12 times larger than the input. That means that two-stage oscillations (http://www.veljkomilkovic.com/OscilacijeEng.html) provide around 12 times more than the input.

Measurings were various. Regarding the camshaft mechanism and forces made with piston mechanisms, etc.

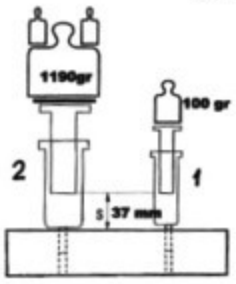
Of course, mistakes are possible, whether smaller or bigger. This is not strange in physics. It is also possible to improve devices. The main thing is to determine the correct frequencies as well as relations.

Major improvements are possible, which would compensate possible mistakes during the measuring.

You can also see the description of the research of two-stage mechanical oscillations, as well the prototypes and models with which these measurements were conducted:

Veljko Milković

COEFFICIENT OF PERFORMANCE OF THE DOUBLE LEVEL OSCILLATOR - MECHANICAL HAMMER

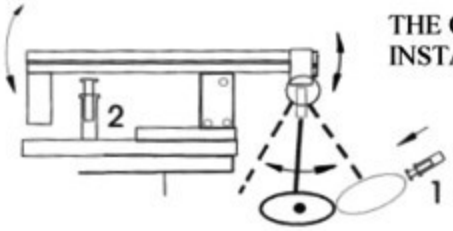


TIME OF SINKING (~2 min) IS EQUALIZED FOR BOTH PISTONS 1 AND 2

1) F = 1 N

2) F = 11.9 N

A= F x s



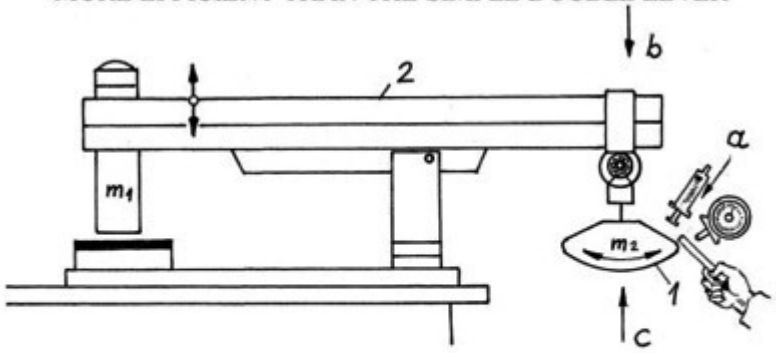
THE OSCILLATIONS (1) ARE ALMOST INSTANTANEOUSLY MAINTAINED

THE COVERED DISTANCE IS 37 mm FOR BOTH PISTONS

1) INVESTED ENERGY=0.037 J
2) GENERATED ENERGY=0.4403 J

IT CAN BE ESTIMATED THAT η=11.9 OR 1190%

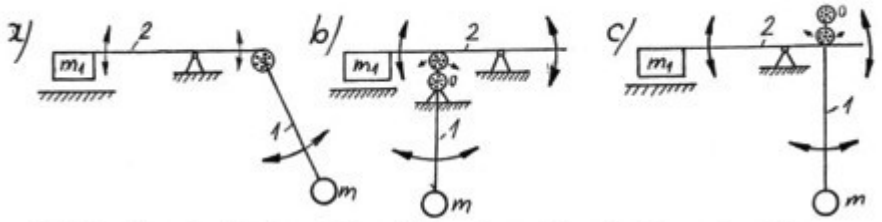
MORE EFFICIENT THAN THE SIMPLE DOUBLE LEVER



a) Minimal changes on the measuring tools (piston, force measuring instrument, spring-plate etc.) while maintaining the oscillations of the pendulum (1).

b i c) There is almost no movement of the double lever (2) even though the measuring tools are maximally loaded during the hits or pushes

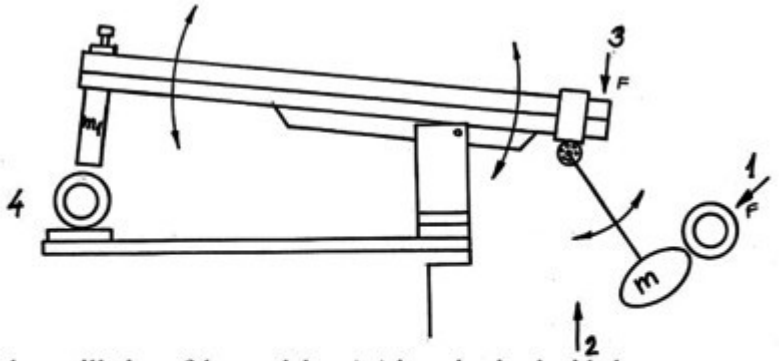
MORE EFFICIENT THAN CAM MECHANISM



START : The physical pendulum (1) is elevated into horizontal position equally for all three version (staring amplitude ~180°)

Number of hits of the double lever with m1		Duration of the pendulum's energy min	sec	Deformation of the sponge min	sec
a	78	19 min	08 sec	19 min	22 sec
b	21	1 min	20 sec	–	40 sec
c	37	1 min	49 sec	–	51 sec

MEASUREMENT WITH SPONGE-PIPE



1/ When the oscillation of the pendulum (m) is maintained with the sponge-pipe (1) there it is not deformed significantly, but the sponge-pipe (4) on the left side of the double lever with m1 is maximally deformed

2 ; 3/ When the right side of the lever is pushed with the sponge-pipe from the bottom or top position while the double-lever is resting, then the deformation of sponge-pipe (4) is insignificant but the sponge-pipe (1) is maximally deformed

Measurements using an oscilloscope have been performed recently. Dynamo flashlights have also been used. One handheld dynamo flashlight was used to push a pendulum in peak position to maintain the oscillation of the pendulum and the other dynamo flashlight was positioned under the lever on the output part of the oscillator.

Measuring was performed and voltage values were acquired for the dynamo flashlight used for maintaining the oscillation of the pendulum and the one pressed by the lever during oscillations:

Dynamo flashight analysis (200 KB; PDF --- in English):
http://www.veljkomilkovic.com/Images/Analysis_of_the_dynamo_lamp.pdf

Measurement with an oscilloscope (514 KB; PDF):
http://www.veljkomilkovic.com/Images/Measurement_with_oscilloscope.pdf

An official measurement was also conducted in cooperation with the Institute for energetics, electronics and telecommunications in Novi Sad (University of Novi Sad, Serbia). The same dynamo flashlight were also used (one was used to push the pendulum in peak position to maintain the oscillation of the pendulum and the other one was positioned above the lever on the output part of the oscillator) and the following values were acquired: ...

http://www.veljkomilkovic.com/Images/Results_of_official_electric_measurement.pdf

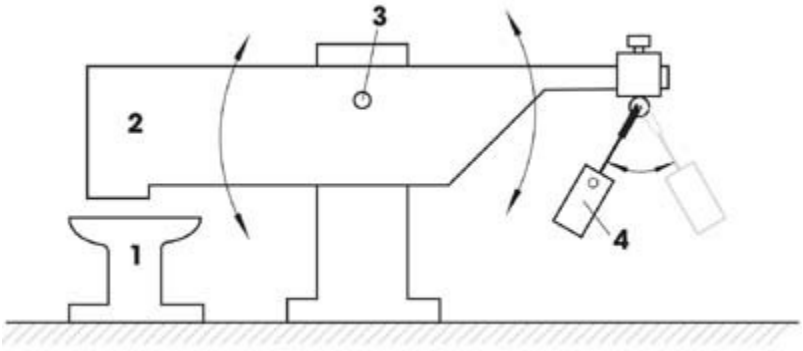
---

ABSTRACT

RESEARCH OF TWO-STAGE MECHANICAL OSCILLATIONS
TWO-STAGE MECHANICAL OSCILLATOR - UNUSUAL MACHINE

A simple mechanism (Figure 1.) with new mechanical effects, representing the source of energy. The machine has only two main parts: a massive lever and a pendulum. The interaction of the two-stage lever multiplies input energy convenient for useful work (mechanical hammer, press, pump, electric generator...).

Figure 1. Mechanical Hammer with a Pendulum
1 - anvil, 2 - massive lever, 3 - lever axel, 4 - physical pendulum



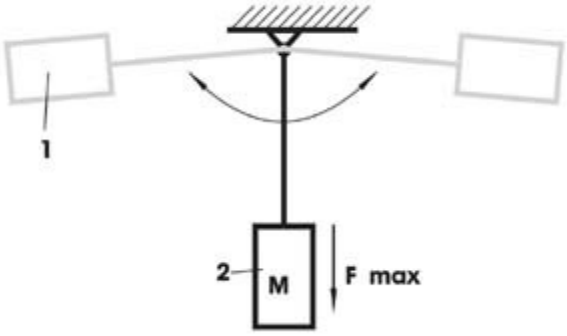
The best results were achieved with the lever axel and pendulum at the same height, and the base of the massive lever above the centre of mass, as shown in Figure 1.

ORIGINS OF ENERGY BASED ON DIFFERENCE IN POTENTIAL

Energy is created due to the difference in existing devices. Consumers of energy use the difference in the potential between the plus and the minus (direct current) and zero and the phase (alternate current). All heat and thermal motors accomplish useful work due to the higher temperature and pressure. Mills and power plants use different levels of water...

However, difference in the potential of two-stage oscillator, "unusual machine" has not been considered so far.

Figure 2. Difference of the Potential during Oscillation of the Physical Pendulum
1 - weightless state in the upper position
2 - culmination of force during the fall in the lower position

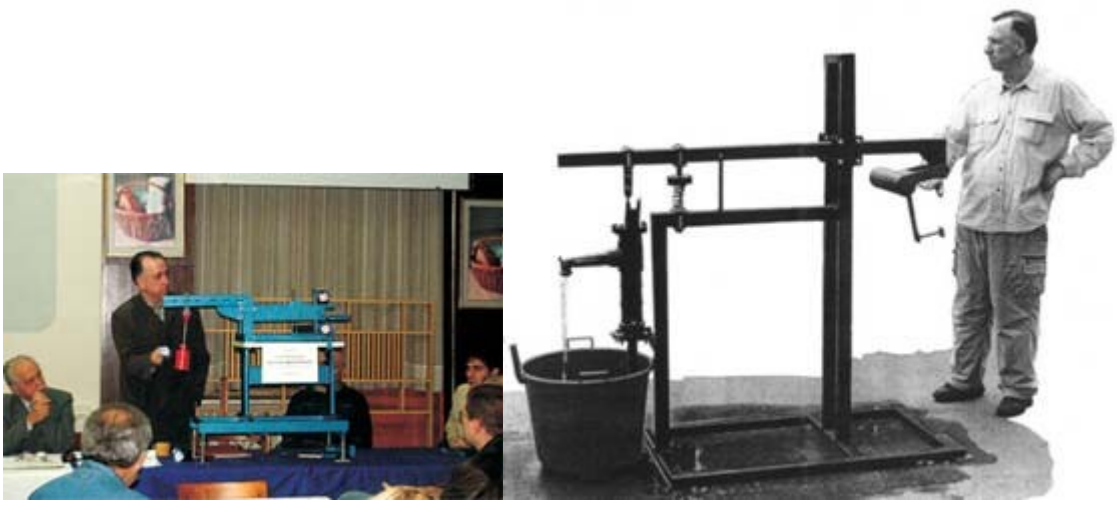


Since there is a difference in potential (Figure 2.) between the weightless state (1) and culmination of force (2) during oscillation of the pendulum, the same is true for centrifugal force, which is zero in upper position, and culminates in the lower position at maximum speed. Physical pendulum is used as a single-stage oscillator in the system with a lever.

After many years of trials, consultations and public appearances, it could be said that this occurrence is being researched and investigated all over the world (author is in possession of evidence). Simplicity enables construction of houses by owners themselves.

Efficiency of the model can be increased by mass, since the relationship between the volume of the lever weight and its surface increases the mass.

Figure 3. Experimental Models



Extreme technical solutions can be tourist attractions even as prototypes.

Previous examples emphasize the importance of synchronized frequency with every model. Oscillations of the physical pendulum have to be maintained with certain speed, otherwise input energy is wasted.

Mechanical hammer (photo & video) and a pump with a pendulum (photo & video) work more efficiently with a shorter pendulum, but with air movement (educational toy - photo & video), longer pendulum works better.

According to the theory of oscillation, oscillatory movements in nature are the most frequent ones, and can be difficult to analyze.

POSTULATES AND DOGMAS

The easiest way is to proclaim something as impossible and refer to laws. However, are all laws of Physics perfect and eternal?

Luckily, and most probably, they are not. Therefore, exceptions of extremely efficient machines are possible (Fig. 1-3.).

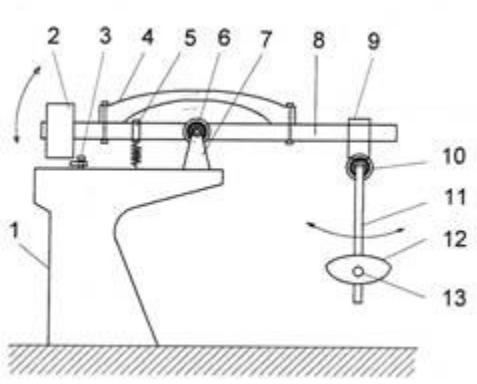
In the same way, the speed of light can be deemed unreachable, according to Einstein's formula E=mc2, because the mass would be infinite. However, the mass does not change with speed, and the kinetic energy increases with the square speed. Therefore, the speed of light can be reached by future space crafts, if these ideas are considered.

PHOTO & VIDEO PRESENTATION of two-stage mechanical oscillations research (prototypes and models, the new mechanical effects, experiments...):
http://www.veljkomilkovic.com/PrototipiEng.html

A LEVER WITH A PHYSICAL PENDULUM AS A SIMPLE MACHINE

Although the basic model, which Veljko Milkovic called "The mechanical hammer with a physical pendulum", showed in the first experiments that the output energy is larger than the input energy, Milkovic concentrated on the practical use of the model. This can be seen by the order of the patent requests. Later, it turned out that this model is also a perpetuum mobile, when usage of input energy is in question. However, the model is energetically open both at the entry and the exit part, so the exact measurement of efficiency would be complicated. The matter of the exact measurment was postponed, but the noticed fact was that the model represents a new type of a simple machine, and that is very interesting and useful, even without multiplying input energy.

The next part will cover the characteristics of the "basic model" which make it a simple machine, putting aside the matter of the efficiency percentage.

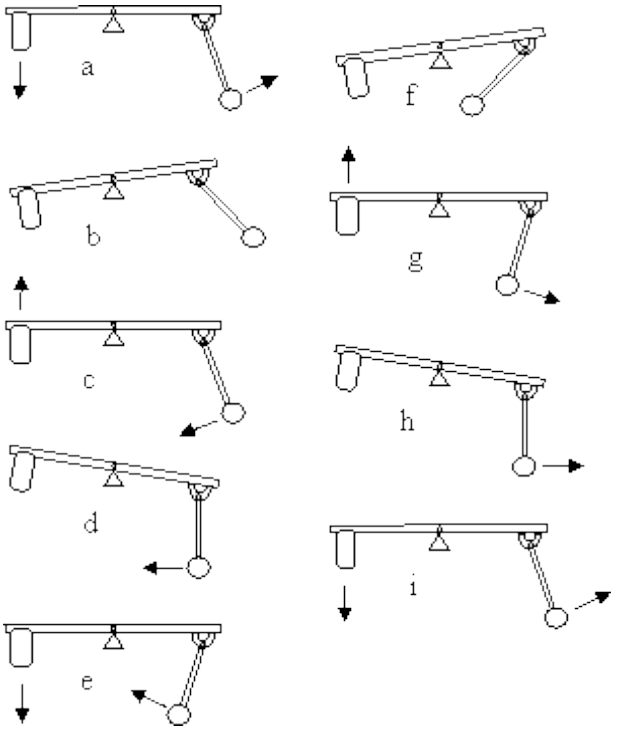


Mechanical hammer with a physical pendulum is an original device - a machine which is turning the oscillations of the physical pendulum, hanged on an arm of a two-armed lever, into the oscillations of the weight on the arm of the same lever. The axis of rotation, the axle of the physical pendulum is parallel to the axis of rotation, the axle of the lever. The axle bed of the lever is connected to the surface with girders. The axle of the physical pendulum is oscillating up

and down, when the pendulum is out of balance. Thus, the weight on the other arm of the lever is oscillating as well. The arm on which the pendulum is positioned is lifted with every movement of the pendulum away from the balance, because the weight of the pendulum weight is decreasing, and the same lever arm is lowering when the pendulum is closer to the balance position and that happens in succession. The period of oscillation of the lever and the weight on it is twice shorter than the period of oscillation of the physical pendulum and the weight on it.

In Picture 1, the triangle represents the support for the two-armed lever. The small circles are the two axis. The lever rotates on one and the physical pendulum on the other. On the right arm of the lever is an angle on which the physical pendulum is oscillating, and on the left arm is the weight which oscillates together with the lever. As soon as the physical pendulum is out of balance and begins to oscillate, the lever starts to oscillate as well..

Picture1



Forced oscillation of the weight on the lever can be of an impact type when the weight, at the end of every oscillation, hits the surface or an object on the surface like a hammer. At that moment, the force of the impact is greater than the force maintaining the oscillation of the pendulum, which still does not say anything about the balance of energy since the effect of these two forces is not simultaneous. It would be a completely different story if we were talking about strength and not force, but we would need a different approach in that case.

"EXCESS" ENERGY

Veljko Milkovic conducted a series of experiments on the basic model - mechanical hammer with a physical pendulum. All the experiments led to the conclusion that the input energy is smaller than the output energy. Since the law of energy sustainability could not help here, he did not spend too much time to explain the occurrence in a theoretical way.

One of the possible explanations was the effect of the forces involved in the work of the oscillators. Forces are more specific and simple physical entities than energy. However, there were many different forces present during the experiments, so it was hard to compare them.

Most of the experts and scientists familiar with experiments conducted by Milkovic did not go into more detailed analysis, with an exception of professor Bratislav Toši?. Unfortunately, his extensive mathematical analysis did not provide a clear result concerning the energy balance.

Experts usually followed their instinct. Some were "in favour", some were "against" perpetuum mobile. Among the first group, after some hesitation, was Nebojša Simin. Sceptical at the beginning, as many other physicists involved in this research, his resistance was defeated with a simple gesture. He put his hand on the lever which was oscillating. The pendulum continued to sway as if nothing happened, while the energy was transferred from the lever to his arm. The lever was working tirelessly, without a decrease in the oscillatory energy of the pendulum. ?imin did not need a more convincing proof than this to convince him that this is the perpetuum mobile. It practically makes no difference whether the lever is doing something or not. That work does not reflect the oscillation of the pendulum, and the pendulum in return, as it oscillates, makes the lever to oscillate too. Simin was positive that the efficiency percentage of the lever with a physical pendulum larger than the one. At the same time, it meant that the law on energy sustainability can not be applied for this model, which is only a step away from the autonomous perpetuum mobile. For the model to be autonomous, it was necessary to come up with an idea how to return a part of the energy from the lever to the pendulum, so that it would not stop because of friction and air resistance. Milkovi? solved this problem as well through his patents.

Unlike Milkovic and his associates, Simin did not like the idea of giving the main role to the gravitational potential. If the friction is neglected, pendulum work force is equal to zero. On the other hand, no one doubted the meaning of the centrifugal force of the pendulum. It was clear from the beginning that they should follow that lead.

A lot of time was spent on the basic model and the matter of maintaining the oscillation of the pendulum, having in mind the friction and air resistance. Milkovic solved that problem with electromagnetic bumpers in the patent "The piston water pump with the pendulum and electromagnets" ,which he handed in for registration on 02/22/01. In that way, he completed his previous model: "Electric generator with the pendulum and magnetic bumpers" , from 06/14/00. Observed individually, neither of these two models are autonomous, but together, they are. The combination of these two models is the first model of perpetuum mobile.

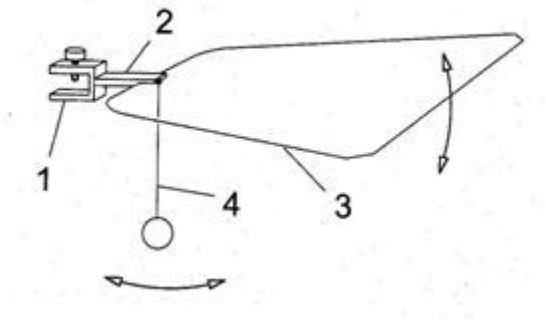
Milkovic was also troubled with the problem of the relatively slow oscillation of the pendulum, which produced low-frequency current. He did not solve this problem fully so far. An attempt with the model: "The electric generator with an elastic pendulum handle" ,which offers faster oscillations, does not solve the problem, because that is a single-stage oscillator which has an efficiency coefficient lower than one. Among the first nine patents, this is the only one which has nothing in common with perpetuum mobile.

"Surplus" or "excess" energy was usually attributed to the gravitational potential. For sceptics, that was the "proof" that this could not be perpetuum mobile, because the gravitational field during oscillation of the pendulum is zero. In their opinion, that was enough to conclude that there could not be "excess" energy. The only thing everyone agreed on was the efficiency of the device.

Qualms about the efficiency coefficient could not be satisfied without a deeper analysis. The matter was the participation of the centrifugal force of the physical pendulum in the lever oscillations, as well as energetic consequences of that participation. That force does not influence

oscillation of the pendulum, but is directly responsible for the oscillation of the lever. It is clear that the axis of the pendulum, if we neglect the rotation, does not have kinetic energy in the pendulum system, but it does in the lever system. However, potential energy of that point changes in the lever system. It was not clear whether the change of the potential energy, despite it is zero during one oscillation, has any effect on the phenomenon as a whole. As far as the work is concerned, the pendulum operates against friction and air resistance, and the lever operates, for example, through the hammer hitting the surface, or by producing the alternative current by means of induction. It was not clear which work force was bigger, the pendulum or the lever. The response could not be a direct one, because precise measuring was needed, but it could not have been conducted on the original model. This was also the case with the models Milkovic constructed in the meantime. One of them is the fan, which is a two-stage oscillator (Picture 2.). The fan is swaying for unusually long time after the pendulum has only once been put out of balance. But, the theoretical explanation in this case is even more complicated that the one of the original model.

Picture2



Let us get back to the basic model. Some things are obvious just when you look at the movements of the two-stage oscillator. There is a significant difference between the two conditioned oscillators. The lever is forced to oscillate, unlike the pendulum. The opposite is not possible because of the influence of gravity on the weight of the pendulum. If the pendulum is connected to an external energy consumer, the pendulum soon stops with oscillations, as well as the lever. However, if the lever is connected to an external energy consumer, the pendulum continues with oscillations. If the external consumer does not take all the energy from the lever, it will continue to oscillate with a smaller amplitude. If we suppose that the positive work force of the lever, and it's useful work force are greater than the work of the pendulum while it is overcoming friction and air resistance, we get "excess" energy. That "excess" can occur only due to the centrifugal force of the pendulum. However, is that really "excess" energy or does it just seems so?

ENERGY OF A PENDULUM AND A LEVER

By definition, energy is a capability of an object to perform work. Therefore, energy does not cause any consequences on anything, but it could and could not have consequences in regards of another object starting to move.

Even a basic model made by Milkovic established that a change of the lever energy does not change the pendulum energy. Mechanical energy of the lever, in the pendulum system, is equal to zero, so that the lever is not in position to affect the pendulum. In the surface system, the lever energy is different than zero, and it can perform work if something is on its way. The lever can

perform work be hitting the surface, but it would still not affect the pendulum. What ever happens to the lever, the pendulum energy will not change.

Energy of the lever is at the disposal of an external energy consumer, which does not affect the energy of the pendulum, whether the lever is doing anything or not. If the external consumer takes over a part of this energy, the oscillating amplitude of the lever will decrease. Since the lever is the one oscillating forcibly and not the pendulum, it continuos with oscillations even when partly dampened. Oscillation of the pendulum is uninterrupted even when the lever oscillation is completely dampened. As soon as the lever stops being a working body and stops providing energy to the external consumer, it starts oscillating again, with a same amplitude as before. This is a clear and unambiguous sign of "excess" energy.

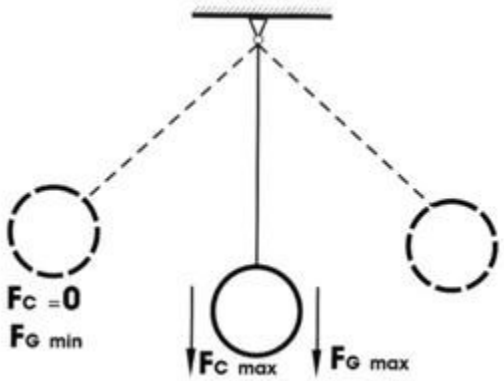
Mechanical energy of the lever occurs without additional input of energy from the outside, due to the way in which the pendulum is moving. Work force of the lever does not mean that a pendulum must lose it's part of the energy. Pendulum just needs to be moving. On the other hand, the pendulum is not moving because it is getting the energy from somewhere outside, but because of inertia. In other words, the lever is capable to denounce a part of its energy for the external consumer, even though that process does not include any working body outside of the device. This is all under condition that the pendulum is oscillating without obstructions. It is understood that the pandulum has been previously thrown out of balance. After a short time, this energy in the total operational, energetical or power balance can be neglected.

Friction and air resistance were the stumbling block, in both theoretical and practical sense, especially on the pendulum. Milkovi? solved this problem in an indirect way, with the combination of two models.

In this way, interpretation of the device does not fall under the usual theory of energy sustainability. Classic mechanics either did not foresee objects such as multi-stage oscillators or it overlooked certain characteristics of these object. Or, maybe both.

GRAVITATIONAL POTENTIAL EVERYWHERE

Whether we like it or not, gravity exists and we can not influence it, since there is still no gravity isolator. However, physical pendulum is in weightless state in its upper position during oscillations.



This works as a substitute for a gravity isolator, and the efficiency proved to be extremely high at two-stage oscillators shown above.

Experiments also confirmed supplemented formula for kinetic energy, which explains the surplus of energy.

Speeds are added together, originating from the impulse i.e. energy invested in maintaining the pendulum in oscillation, which happens in the upper position.

Additional acceleration of the pendulum is due to gravity. If the above mentioned formula is applied for calculation, the surplus of energy is clear, and it originates from gravitational potential.

$$E_k = \frac{M(v_1 + v_2)^2}{2}$$

In addition to results in earthly conditions, space probes had excellent results, so it is useful to mention that kinetic energy can be increased with the help of gravity.

VIDEOS

Videos of two-stage mechanical oscillations research with review of new mechanical effects, experiments, prototypes, models, measurements... and introduction of new source of energy on the basis of inertial forces and gravity:

1. Full presentation (36 minutes - 44 MB; English subtitles) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-1)_full_video_presentation.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-1)_full_video_presentation.wmv

Excerpts:

2. Device for testing single-stage and two-stage oscillations (06:34 minutes - 7.28 MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-2)_Device_for_testing.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-2)_Device_for_testing.wmv

3. Fast model with an eccentric rotor (01:38 minutes - 1.82 MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-3)_Fast_model.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-3)_Fast_model.wmv

4. Mechanical hammer with a pendulum (04:46 minutes - 5.29 MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-4)_Mechanical_hammer.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-4)_Mechanical_hammer.wmv

5. Laboratory pump with a pendulum (04:20 minutes - 4.82 MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-5)_Laboratory_pump.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-5)_Laboratory_pump.wmv

6. The universal two-stage oscillator as mechanical hammer (the weight of hammer is approximately 25 kg) (0:48 sec. - 3MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-6)_Universal_oscillator-hammer.wmv

http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-6)_Universal_oscillator-hammer.wmv

7. The universal two-stage oscillator as electric generator (nine small generators --- dynamo flashlights as output work) (0:46 sec. - 6.5 MB) ---
http://www.veljkomilkovic.com/Video/Veljko_Milkovic_(video-7)_Universal_oscillator-generator.wmv
http://www.micropixel.biz/veljkomilkovic/videos/Veljko_Milkovic_(video-7)_Universal_oscillator-generator.wmv

---

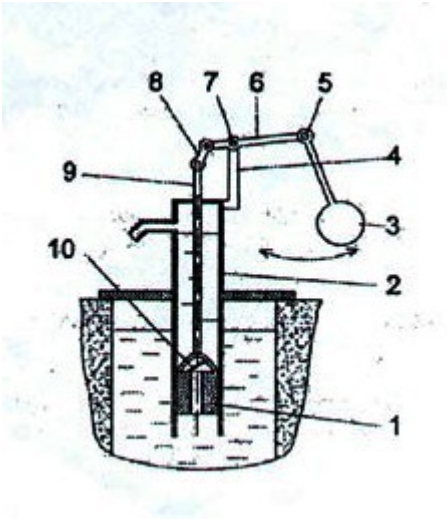
YUGOSLAVIAN PATENTS

Veljko Milkovic has registered some 110 inventions with the former Federal institute for patents, now Federal Intellectual Property Office (**www.yupat.sv.gov.yu**) in Belgrade (Serbia). On the base of that, 36 patents have been issued.

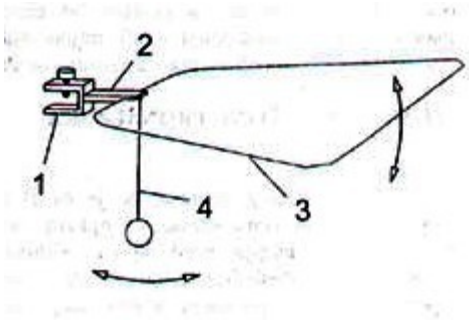
Veljko Milkovic is presently in possession of 22 patents, with several new ones on the way.

Below you can see titles of patent documents, for the latest 22 that had been approved:

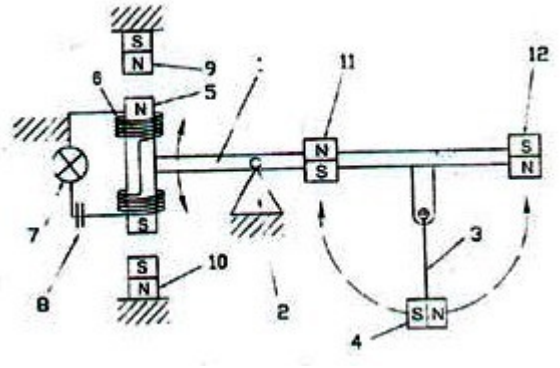
(1)
P-577/99 --- Hand Water Pump with a Pendulum



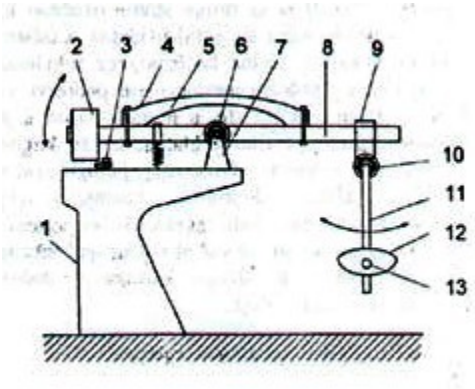
(2)
MP-32/00 --- Fan with a Pendulum



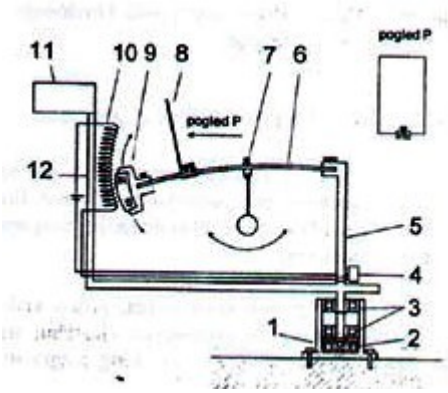
(3)
MP-37/00 --- Electric Generator with a Pendulum and Magnetic Bumpers



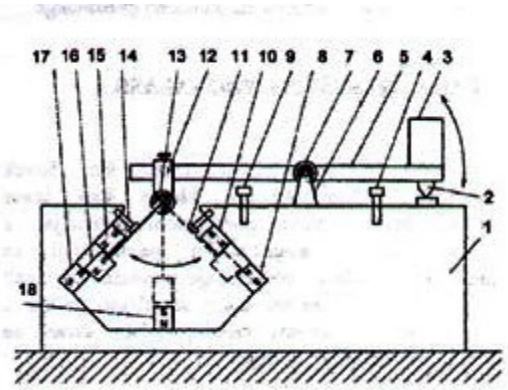
(4)
MP-60/00 --- Mechanical Hammer with Adjustable Pendulum Weight



(5)
MP-63/00 --- Electric Generator with Wind and Gravity Drive

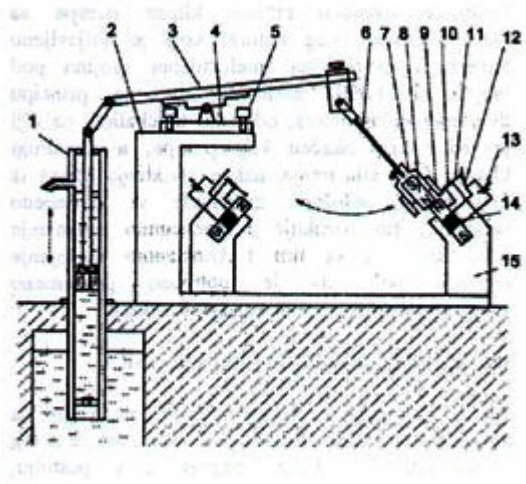


(6)
MP-14/01 --- Press with a Pendulum and Magnets



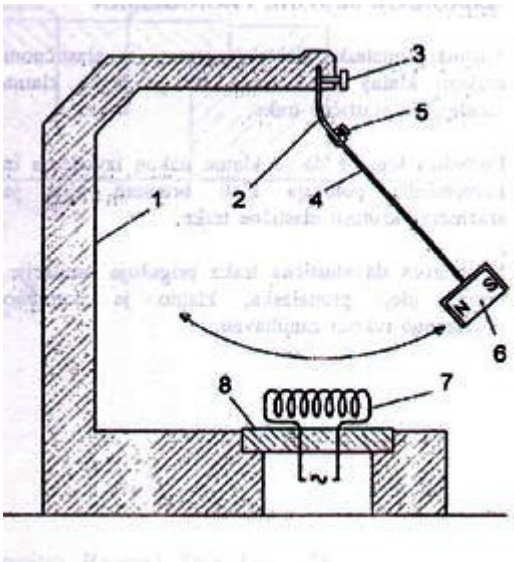
(7)

MP-23/01 --- Piston Water Pump with a Pendulum and Electro Magnets

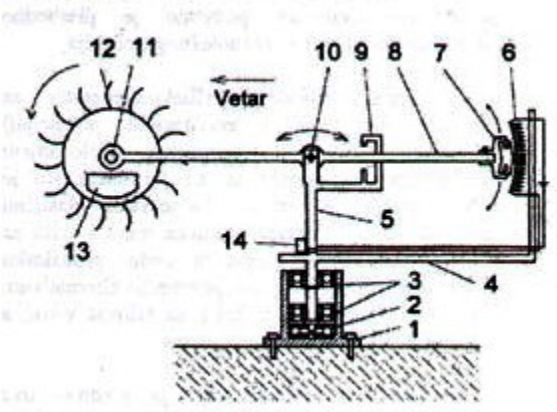


(8)

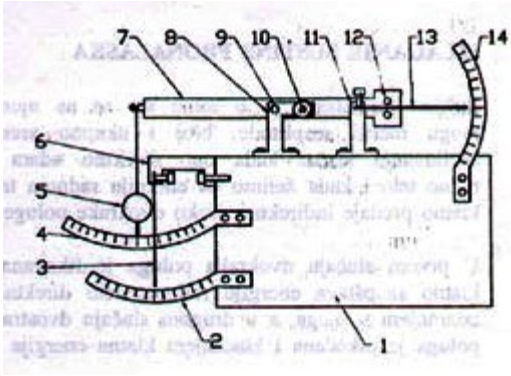
MP-33/01 --- Electric Generator with an Elastic Pendulum Handle



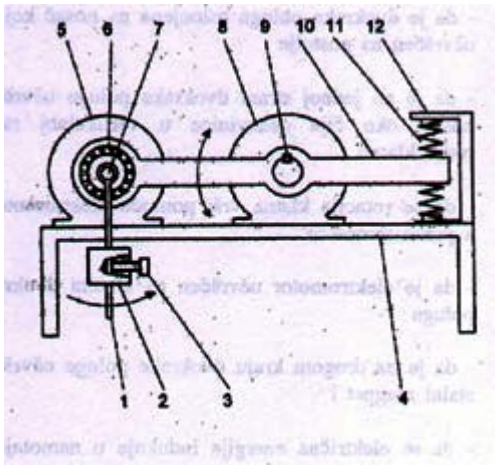
(9)
MP-4/01 --- Wind Generator with a Two-Armed Lever and Wind Circle with an Eccentric Mass



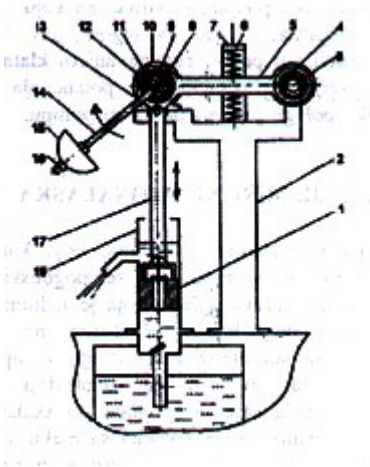
(10)
MP-106/01 --- Instrument for Comparing the Amount of Work Created by a Pendulum...



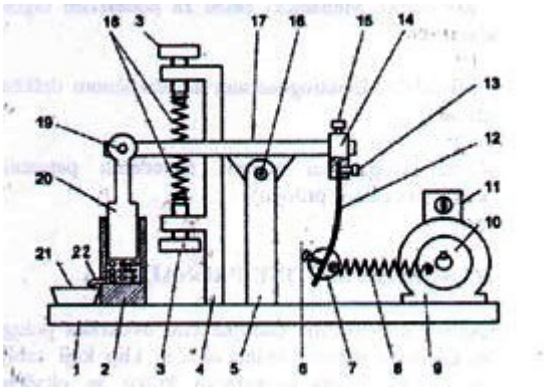
(11)
MP-32/02 --- Device for the Production of Energy from Gravitational Potential and Centrifugal Force with Instrumens for Efficiency Measurements



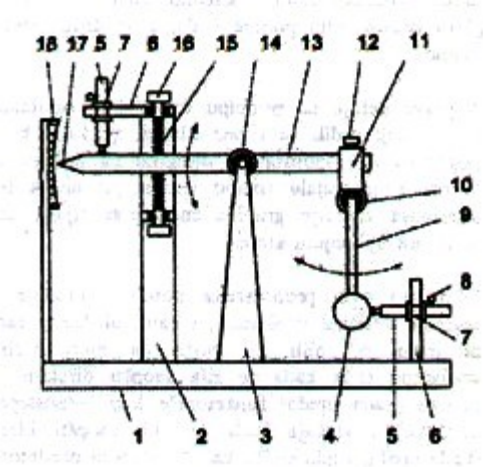
(12)
MP-65/02 --- Piston Pump with an Electric Motor and an Excenter



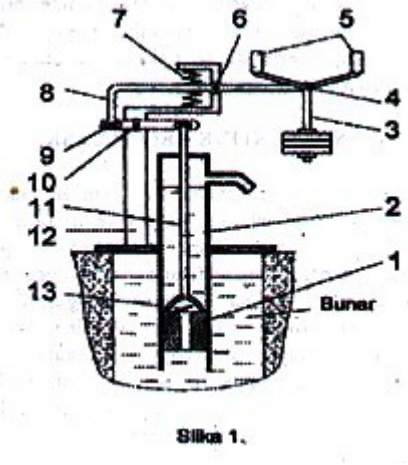
(13)
MP-78/02 --- Sieve with a Two-Armed Lever and a Pendulum that Oscillates under Force



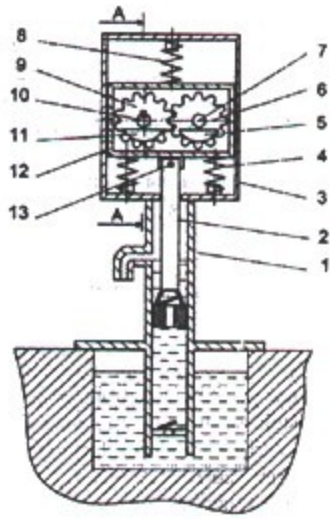
(14)
MP-80/02 --- Device for Inspection of Oscillations Created by a Two-Armed Lever and a Pendulum Depending on the Place of an Impulse Force



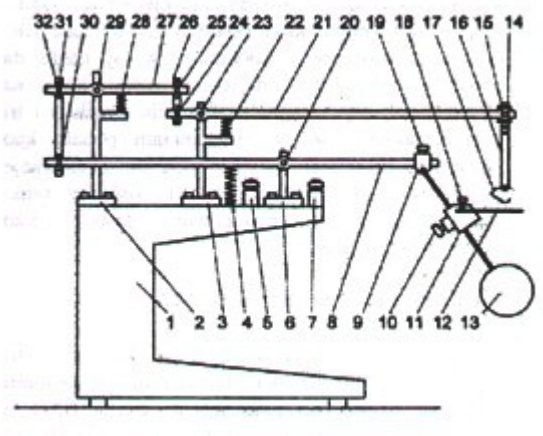
(15)
MP-90/02 --- Hand Water Pump with a Pendulum



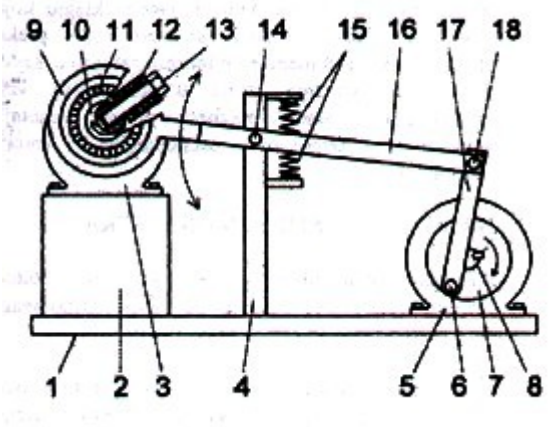
(16)
MP-94/02 --- Piston Water Pump with an Electric Motor and Cogwheels with an Eccentric Mass



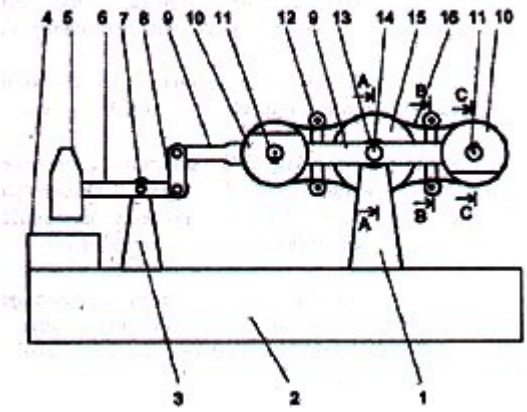
(17)
MP-98/02 --- Mechanical Toy with a Pendulum and Three Oscillating Levers



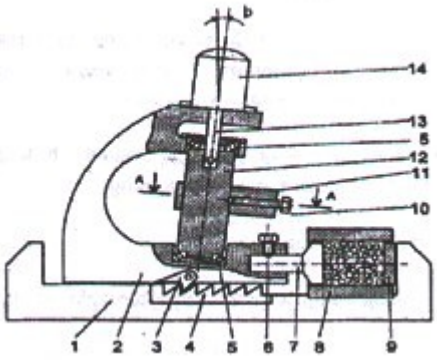
(18)
MP-100/02 --- Generator of Electrical Energy Driven by an Electric Motor, Gravitational and Centrifugal Force



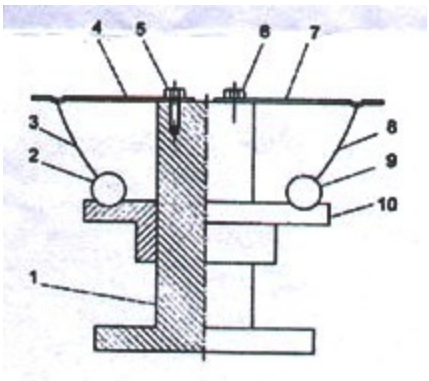
(19)
MP-122/02 --- Hammer with an Electro Motor Drive and Rotating Eccentric Masses



(20)
MP-129/02 --- Horizontal Press for Briquette Production



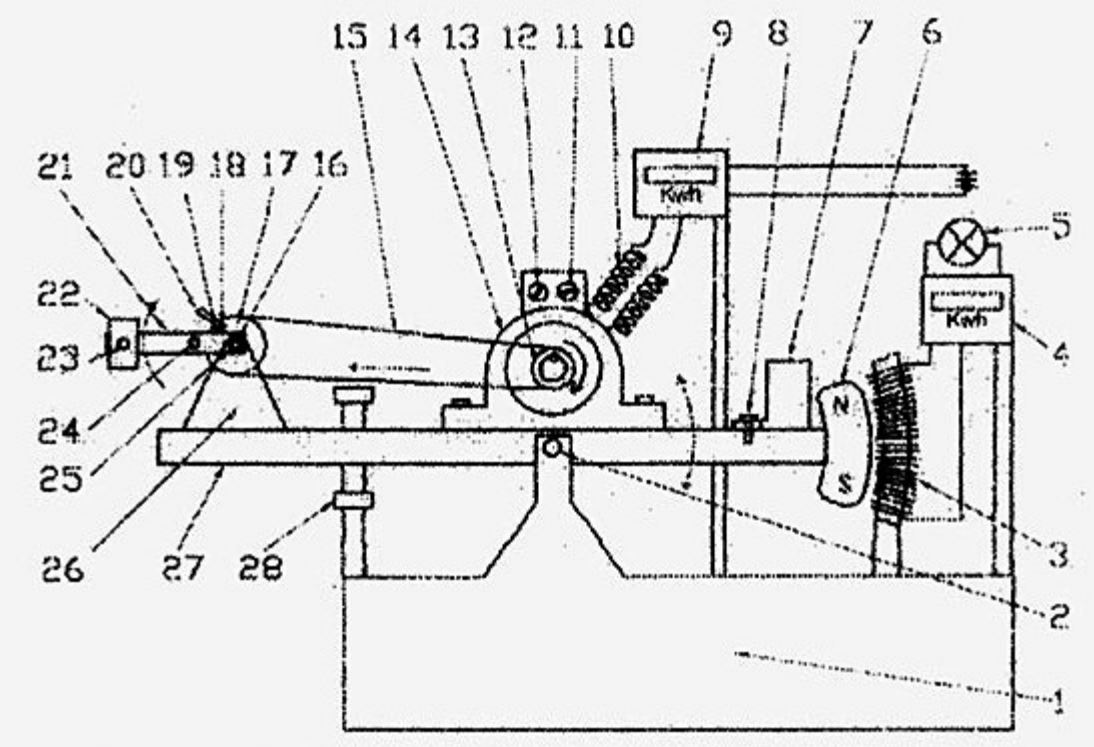
(21)
MP-27/04 --- Instruments for Comparison of Single-Stage and Two-Stage Oscillations



---

(22)

799/03 (49463 B) --- Machine for Producing Energy from Gravitational Force with Efficiency Measuring Instruments

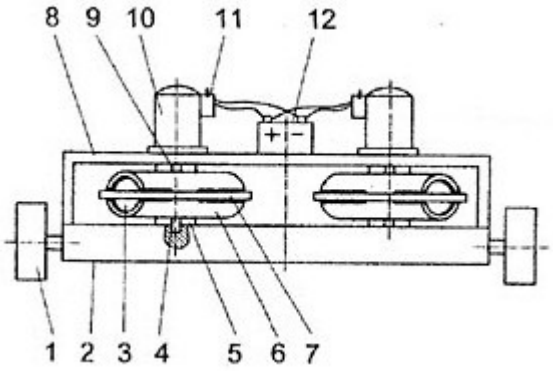


Abstract --- Machine for producing energy from gravitational force with efficiency measuring instruments comprises of a foundation (1) whereon over a spindle (2) is set a double arm lever (27), the oscillation amplitude of which is limited by a position arrester (28). On the double arm lever (27) is on one side hanging a pendulum (21) with a weight (22), and on the other side a permanent magnet (6) opposite to which on the foundation (1) is fixed an induction coil (3). Pendulum (21) is hung on one side os the double lever arm (27) over the bearings (25) that are drawn over the pine (16) that is firmly fixed near the top of the carrier (26). On the pendulum (21) laterally fixed is a roller (24), and on its loose end a weight (22) position of which in relation to pivot axis is adjustable by a screwed bolt (23). On the same spindle (16) over the bearing (29) is set a pulley (17). The distance from the loose top of lever (20) and roller 924)

from the spindle axis (16) is equal. He pulley 917) over the belt (15) is coupled to a pulley 913) at an electric motor (14) that is fixed in the middle of the double arm axis (27) and to which an electric energy consumption measuring instrument (9), a regulator for continual change of number of revolutions (11) and a timer 912) of programmed time for the temporary switch on of the electric motor (14) are connected. On the opposite side of the double arm lover (27) is set the weight (7), position of which is adjustable by means of the screwed bolt (8) On the same side the permanent magnet (6) is set, opposite to which is on the foundation (1) fixed an induction coil (3) with consumer (5) and an instrument (4) for measuring the quantity of produced energy.

---

(23)
P-390/04 -- Device for Studying Inertial Forces



Abstract --- Device for studying inertial forces, consists of a platform (2) whereon are laterally set wheels (1). On the platform (2) from the top transversely and firmly set is a frame (8) onto which are from the top fixed a cell (12) and symmetrically two electric motors (10) with regulators (11) for adjusting number of revolvements. On the shafts (9) of the electric motor (10) are fixed the pipes (6) that are from the bottom side in the same axis by means of the pins (4) set in the platform (2). Thus the pipes (5) may revolve in horizontal plane. The pipes (6) are separated along the middle, and in them from both sides the globes (3) diameter of which is shorter than the internal diameter of the pipe (6). On the platform (2) by means of the screws (13) are fixed the holders (5) whereon are firmly fixed the rings (7) that go through horizontal cross-sections set on both sides of the pipe (6), where adjusting of the distance of the center among the rings (7) is allowed in relation to the axis of the electric motor 910), i.e., center of rotation of the pipe (6). Along with the idea of the invention, by means of a regulator 11, it is possible to changed the speed and directions of rotation of the pipe (6) and by the screw (13) to alter the size of rotation eccenter of the globes (3) in relation to the center of rotation of the pipe (6), as the path of the globes (3) is defined by the internal circumference of the ring (7). As the size of the centrifugal force of the globes (6) depends on the radius of rotation and speed of angle, thus it is allowed to adjust the speed and direction of motion of the wheels.

---

http://www.veljkomilkovic.com/Images/Misljenje%205.JPG

Opinion of Prof. Dr. Velimir Abramovic

Subject: Double Oscillator Invented by Veljko Milkovic

Time Institute --- Foundation for the Science of Time
Dordtselaan 137a
3081 BL Rotterdam
Halandija

Belgrade (20 June 2002)

I happen to have visited inventor Veljko Milkovic in Novi Sad and gained insight into his original and useful work on double mechanical oscillator.

It is a lever with a pendulum at one end, a mechanical machine using a principle that no mechanic before Milkovic, including Archimedes, thought of.

In addition to obvious practical application, with the system output several times larger than the input force, double oscillator has important theoretical characteristics:

(1) When the pendulum is out of balance it becomes a system without inertia, which uses gravity to oscillate and turns it into rotation through the lever.

(2) Obstructions on the lever do not influence the pendulum, which means that the pendulum is independent from the lever, but the opposite is not the case. In other words, gravity is the reason for mechanics. It is a reversible gravitational-mechanical process which turns gravity into mechanical work and vice versa, an obvious process in nature. The sum of gravity forces is always larger than the sum of losses: which is the precondition for constant movement of heavenly bodies.

(3) The double oscillator is also the best mechanical analogy of the alternating current, even better than Tesla's analogy.

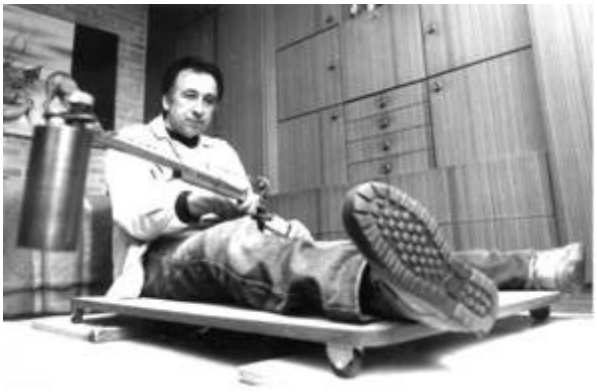
A model has been set up in Mr Milkovic's apartment: a water pump that needs only a slight pressure with one finger to put the pendulum out of balance and add impulses with a minor force. The output is enormous compared to the input force of pumping. Practical advantages are obvious.

Anti-Gravity Motor

It is very strange, but it turned out that the same invention fulfils two ancient human dreams. One about a machine which works continuously, and the other about the flying device which moves according to the wish of the person on the device. Here, of course we do not mean aeroplanes and rockets, but a flying machine that does not use any kind of fuel. A vehicle with such a motor could move on the ground, in the air or anywhere in space, without fuel.

Anti-gravitational motor is machine that confronts so-called "laws of nature". This idea could not have been believed in, without being pronounced naive or demented. Anti-gravitational motor belong to the field of science-fiction, although contemporary physics knows the case where a law of action and reaction does not apply in one inertial system. This is the magnetic force which is emanated by two particles as they move.

Picture 1 --- A cart with one pendulum askew



Inconsistency is frequent in physics. Besides, mechanics is somehow outdated, and left to technicians and mathematicians. These three disciplines do not have the same basis, and they are more inconsistent than it is usually recognised. Physics explores occurrences and events in nature, independent of their meaning to humans, whilst technique deals with the possibility to join these occurrences in one whole. Mathematics precisely defines conditions under which these occurrences happen, but does not, and can not, take into account the meaning of these occurrences, which is an integral part of physics. Mathematics also can not express practical purpose of an occurrence, which techniques can. Therefore, these three disciplines, in spite of having things in common, can not merge into one another. Physics basically abandoned the field of mechanics, as if it has nothing more to say.

Classical physics is, in large part, Newton's physics, and he was more of a mathematician than a physician. Maybe that is one of the reasons why there is a span of several centuries between the discoveries of Galilei and perpetuum mobile, and even an anti-gravitational motor. Physics is relying too much on quantification of physical constants that are part of a certain occurrence, while, at the same time, it ouches the qualification of these same occurrences to the side.

As far as technique is concerned, it prospered immensely, especially in the 20th century. On the other side, it is well known that new discoveries are usually technically very simple. For example, from a technical point of view, Milkovi?'s cart shown in Picture 2. looks more like a toy than an attempt to make an anti-gravitational motor. When you look at it from the physics point of view, it looks completely different.

Picture 2 --- Small cart with a pendulum askew

This cart contains everything an anti-gravitational motor needs. As with other models made by Milkovi?, there is an inertial force pushing them in one direction. The main part of the model is a physical pendulum which is askew and is moved by gravity. Gravitational field should be

replaced with a magnetic field, to enhance the efficiency of the model. Milkovi? made a model with two askew pendulums, which oscillate with phases positioned towards one another in an angle of 180°.

Picture 3 --- A cart with two pendulums askew

Perpetuum mobile and an anti-gravitational motor have been hiding in the shadows of scientific thought for along time. That shadow certainly contains many similar "scraps", awaiting future exploration.

Cart with a pendulum - Vehicles with internal and inertial drive

New video presentation of Serbian inventor, Veljko Milkovic, demonstrating his perennial research work on the idea of moving vehicle without indirect mechanism (transmission). Milkovic explains a new power and how the isolated powers can perform one-way moving of model using tensile forces of physical pendulum.

There is also an attempt to improve and to confirm the law of action and reaction (The third Newton?s law), which hadn?t undergone any revision from its beginning.

From the contents: Tensile forces of physical pendulum, Motion without usual reflection, An addition to the Law of action and reaction (The third Newton?s law), Cart with a pendulum, Truck with horizontal physical pendulum...

This video is an excerpt from the TV show ?Svet ideja?, Radio Television of Novi Sad (Serbia) recorded in 1996.

YouTube video in English, 7 min.:
http://www.youtube.com/watch?v=4foY5r2TMOo

More info:
http://www.veljkomilkovic.com/Antigravitacioni_motorEng.html

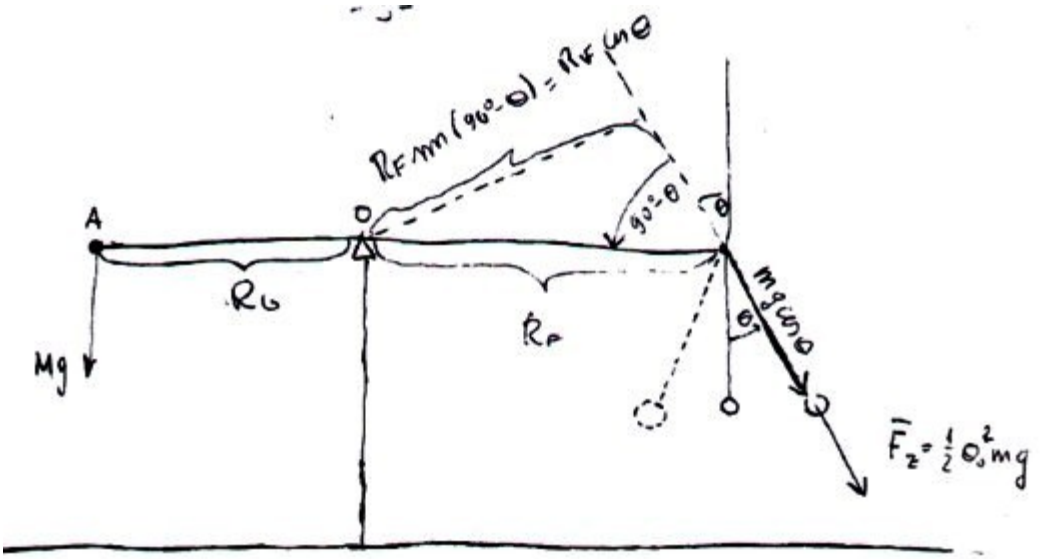
Additional information can be found also in the book by Veljko Milkovic "Anti-gravity motor":
http://www.veljkomilkovic.com/KnjigeEng.html#motor

MATHEMATICAL ANALYSIS
(Excerpt)

by

Prof. Bratislav Tosic

(http://www.veljkomilkovic.com/Images/Mislhenhe3.JPG)



$$\ddot{\varphi} = -\frac{g}{R_F} + \frac{g}{R_F}\frac{M}{m}\frac{R_G}{R_F} - \frac{g}{R_F} - \frac{\Theta_0^2}{2}\frac{g}{R_F} + \frac{g}{R_F}\Theta^2 + \frac{1}{2}\Theta_0^2\frac{g}{R_F}\cdot\frac{1}{2}\Theta^2$$

$$\ddot{\varphi} = \frac{g}{R_F}\left(1 + \frac{1}{4}\Theta_0^2\right)\Theta^2 - \frac{g}{R_F}\left(2 + \frac{\Theta_0^2}{2} - \frac{M}{m}\frac{R_G}{R_F}\right) \quad \ldots\ldots (20)$$

Complete Mathematical Analysis of Biphase Oscillator (9 pages):

http://www.veljkomilkovic.com/Images/Misljenje%204%20-%20Mathematicka%analiza%20-%20Tosic.pdf

ANALYSIS OF THE INFLUENCE OF THE CENTRIFUGAL FORCE DURING OPERATION OF THE TWO-STAGE MECHANICAL OSCILLATOR BY VELJKO MILKOVI?

"...It seems clear that the influence of the centrifugal force is the key to the explanation of the energy surplus of the two-stage oscillator by Veljko Milkovi?, the inventor."

http://www.veljkomilkovic.com/Images/Analysis_Jovan_Bebic_1.pdf

MEASURING THE RATIO OF OUTPUT AND INPUT ENERGY OF THE TWO-STAGE MECHANICAL OSCILLATOR BY VELJKO MILKOVI?

"...Therefore, ratio of energy at the output and energy at the input is 22.89..."

http://www.veljkomilkovic.com/Images/Analysis_Jovan_Bebic_2-measuring.pdf

CALCULATION OF ENERGY SURPLUS OF THE TWO-STAGE MECHANICAL OSCILLATOR IN THE EXPERIMENT WITH MANUAL DYNAMO LAMPS

In one more analysis and measurement, Jovan Bebic considers the efficiency of Veljko Milkovic's two-stage mechanical oscillator in the famous experiment with the hand flashlights and reports that the output/input ratio is 2.8 times in his same replicated experiment.

http://www.veljkomilkovic.com/Images/Analysis_Jovan_Bebic_3-experiment_dynamo_lamps.pdf

Prof. Francis E. NIPHER Electro-Gravitic Experiments

***NY Times* (19 Sept. 1917)**

***Electrical Experimenter* (March 1918)**

***Trans. Acad. Sci. St. Louis* XXIII (4): 173-176 (July 28,1916)**

***Trans. Acad. Sci. of St. Louis* XXIII (4): 177-193 (July 28, 1916)**

***Trans. Acad. Sci. of St. Louis* XXVII: 383-387 (March 2, 1920)**

***New York Times* (19 September 1917)**

"Professor Tells of Electrical Tests Turning Attraction Into Repulsion."

A new theory as to gravitation will be announced soon before the St. Louis Academy of Sciences by Professor Francis E. Nipper, retired head of the Department of Physics of Washington University.

"It will be shown that gravitational attraction between masses of matter not only has been diminished into zero, but has been converted into repulsion which is more than twice as great as normal attraction."

New Gravitation Theory ~

Professor Nipper made his experiments with bodies suspended horizontally toward each other. By introducing electricity into the atmosphere he converted normal attraction into repulsion.

"If electricity can alter the gravitational attraction of the bodies used in my experiments," he said, "the same force can alter the earth's attraction. If the negative electricity could be drawn from the earth's surface, gravitational attraction suddenly would cease and the cohesion of the earth's surface would be disastrously affected."

***Electrical Experimenter* (March 1918)**

"Can Electricity Destroy Gravitation?"

Is it possible to nullify, and further to even reverse, the effect of gravity by electricity? This scientific conundrum seems about to be solved, at least to a certain extent. To begin with, everybody is familiar with that law of physics which states that "all particles of matter attract each other with a force which is greater the nearer the particles are together", and to be still more definite, Newton's law says that bodies behave as if every particle of matter attracted every other particle with a force that is proportional to the product of their masses and inversely proportional

to the square of the distance between them. It is the gravitational attraction between the earth and the bodies upon it which causes the latter to have weight.

This fact is often lost sight of and should be well understood by every student. To make the matter more clear let us imagine that a man's body is (as by flying, jumping, diving from a high point, etc.) for the moment separated from the surface of the earth. As soon as the mass of the body is separated from the earth, gravitational attraction is set up between the two masses. The earth pulls the man's body, and also his body pulls the earth, but as the mass of the earth is infinitely greater, its movement cannot be detected.

The scientists of today believe that in some mysterious way the minute electrical charges existing on the particles making up molecules and atoms are definitely linked up and concerned with such basic phenomena as gravitation. Since all bodies are made up of atoms it would seem to logically follow that the forces of gravity must depend in some way upon attractions which atoms exert upon each other, and due to the fact that the atoms are separated, at least in solids and liquids, by extremely small distances, we might expect these inter-atomic forces to be relatively more powerful than are those of ordinary gravitation.

Until recently, however, the mystery linking this inter-atomic activity with the force of gravitation baffled all attempts at solution, although many scientists had tackled it.

But at last experimental proof has been forthcoming through the untiring labors of Professor Francis E. Nipher, of the St. Louis Academy of Science. In a pamphlet issued November 8, 1917, Prof. Nipher supplies experimental evidence that gravitational attraction can not only be suspended or nullified by the electrical current, but it actually can be transformed into "gravitational repulsion"!

All during the summer of 1917, Prof. Nipher had his apparatus in almost continuous operation, and the experiments have been repeated time and again, always with the same result.

Prof. Nipher's mechanical apparatus resembled that used in the "Cavendish experiment", by which it was first experimentally proved that Newton's law of universal gravitational attraction applied to small bodies in their action upon each other at short distances, just as well as it did to small terrestrial bodies under the influence of the earth. This apparatus consists of a delicate torsion suspension fiber (**Figure 3** & **Figure 4**), a light, rigid arm at the lower end of the fiber suspension, and at either end of this bar two small lead spheres of known mass. Two equal large balls of solid lead are placed close to the small suspended spheres in the manner shown. Now, remembering our law of physics stated above -- that every body in space attracts every other body proportionally to their respective masses and inversely as the distance between them -- then it is evident that when this apparatus is set up, that the small suspended spheres will be slightly attracted by the larger, stationary balls. This condition is represented in **Figure 1**.

Before connecting any form of electric current to the modified Cavendish apparatus, Prof. Nipher took special precaution to carefully screen the moving element from any electrostatic or electromagnetic effects. His apparatus briefly consists of two large lead spheres ten inches in diameter, resting upon heavy sheets of hard rubber. Two small lead balls, each one inch in diameter, were now suspended from two silk threads, stationed at the sides of the two large lead spheres, from which they were separated by a little distance. Moreover, the suspended balls were insulated elaborately from the large spheres by enclosing them first airtight in a long wooden box, which was also covered with tinned iron sheets as well as cardboard sheets. There was, furthermore, a metal shield between the box and the large metal spheres. The large metal lead spheres now exerted a certain gravitational pull upon the suspended small lead balls as indicated in **Figure 1**, and the small lead balls were slightly pulled over towards the large spheres.

In his first experiments Prof. Nipher applied a high tension current from a static machine to the large lead balls (**Figure 2**). No difference was noted whether the positive or negative terminals were applied. In one of these experiments the masses were "repelled" (normal gravitational attraction had been nullified and changed to repulsion) by a force nearly twice as great as the initial gravitational repulsion. The effect is shown in **Figure 3**.

In further experiments Prof. Nipher decided to check his results. To do this he replaced the large solid lead spheres with two metal boxes, each filled with loose cotton batting. These hollow boxes (having practically no mass) rested upon insulators. They were separated from the protective screen by sheets of glass and were grounded to it by heavy copper wires. The metal boxes were then charged in every way that the solid lead spheres had been, but not the slightest change in the position of the lead balls could be detected. This would seem to prove conclusively that the "repulsion" and "gravitational nullification" effects that he had produced when the solid balls were electrically charged were genuine and based undoubtedly on a true inter-atomic electrical reaction, and not upon any form of electrostatic or electromagnetic effects between the large and small masses. If they had been, the metal boxes, with no mass, would have served as well as the solid balls.

Another interesting experiment was conducted with low frequency alternating current applied to the large lead spheres. Spring contact brushes were fastened to the wooden blocks supporting the large spheres as shown in **Figure 4**, one brush on either side of the ball. This permitted sending current through the ball from one side to the other. First, a direct current of 20 amperes as sent through the two large masses, but no effect on the suspended masses could be detected. Next, an alternating current of 20 amperes was sent through the two masses (See **Figure 4**), with the result that the gravitational attraction was quickly reduced to zero, and not only that but in 15 to 20 minutes the small lead spheres had moved over one-half as much to the opposite direction as the distance they had been attracted originally towards the large masses. Thus gravitation had not only been completely nullified, but it was actually reversed.

Figure 1: "Attractive" effect of gravity between large & small masses. No current.

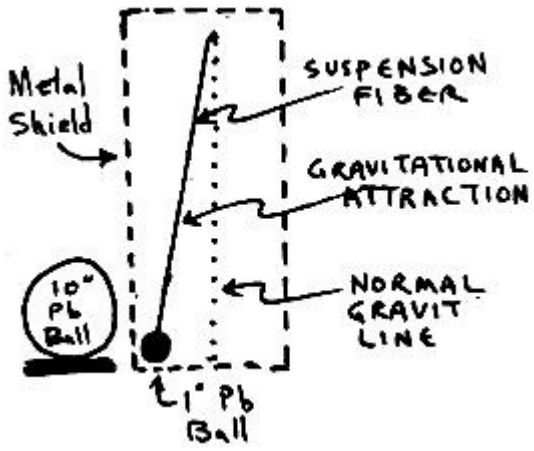


Figure 2: Gravitational repulsion caused between large & small masses. Current on.

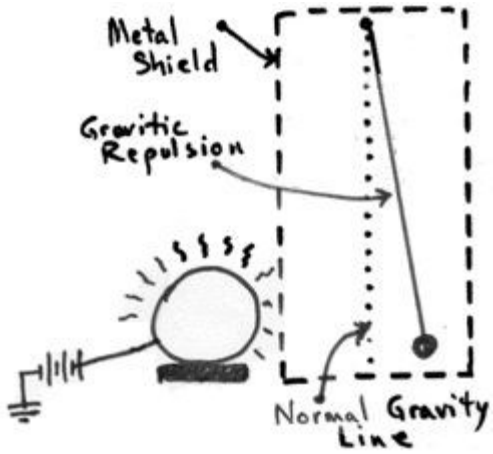


Figure 3: Nipher's experiment with two metal boxes filled with cotton (no mass). No gravitational change with or without current.

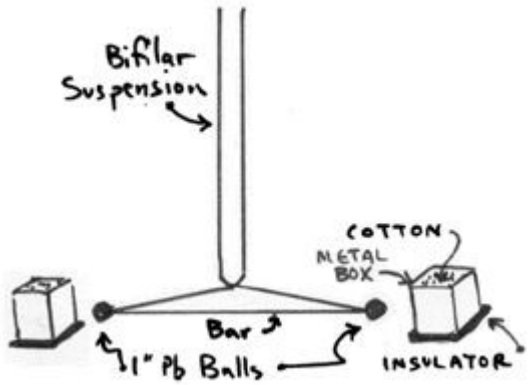
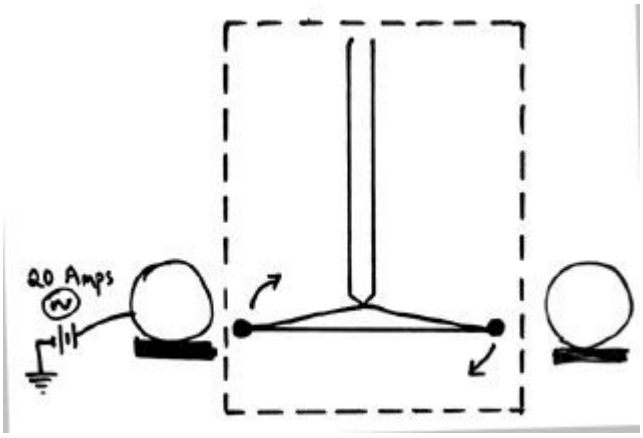


Figure 4: When 20 amps AC was passed through the large balls, the gravitational attraction was reduced to zero and made negative. This repulsion was 50% of the normal attraction.



Trans. Acad. Sci. St. Louis, **pp. 163-175 (July 1916)**

"Gravitation & Electrical Action"

by
Francis E. Nipher

In former publications the present writer has suggested an intimate relation between gravitation and electrical action. (*1)

(*1: *Proc. Amer. Phil. Soc. Philadelphia* 52: 283-6; *Science* (Sept. 1, 1911), pp. 282-3; *Experimental Studies in Electricity & Magnetism*, pp. 19-24.

There can be no doubt of the truth of the statement, that the attraction between any two masses of matter, depends not only upon the amount of matter in the two masses, and their distance from each other, but also upon their electrical condition.

Assume that two spheres, having radii R_1 and r_2, composed of metal having a density *p*, and distant from each other *r*, have electrical charges Q_1 and Q_2, the spheres having a common potential *V*. their attraction for each other will be:

(1)

$$A = K\frac{m_1 m_2}{r^2} - \frac{Q_1 Q_2}{r^2}$$

$$= K\frac{16}{9}\frac{\pi^2 R_1^2 R_2^2 \rho^2}{r^2} - \frac{R_1 R_2}{r^2} V^2$$

$$= K\frac{16}{9}\frac{\pi^2 R_1^2 R_2^2 \rho^2}{r^2} - \left(\frac{9 m_1 m_2}{16\ \pi^2 \rho^2}\right)^{1/2} \frac{V^2}{r^2}$$

Here *K* is the Newton constant of gravitation as it would be determined if electrical action were eliminated, or if *V* were zero absolute. The absolute zero in *V* would be the common potential of the two bodies, under the condition assumed in Eq. (1), when their attraction for each other is a maximum.

The gravitation constant has been determined by methods, which it was assumed made it unnecessary to consider the electrical condition of the two bodies. Nevertheless the results have been very unsatisfactory. In his presidential address before the American Mathematical Society in December 1899, R.S. Woodward (*2) referred to this constant as being one of the constants of the solar system whose determination was in a most unsatisfactory condition, as regards precision.

(*2: *Bulletin Amer. Math. Soc.* II 6: 153)

If the masses are capable of acting upon each other electrically, and the final term in Eq. (1) is omitted, that equation might be written:

(2)

$$A = K\left(1 - \frac{x}{100}\right)\frac{16}{9}\ \frac{\pi^2 R_1^2 R_2^2 \rho^2}{r^2}$$

In this equation an error of *x* per cent in the value of *K* would result. By (1) and (2):

$$V = \frac{4}{3}\pi R_1 R_2 \rho \quad \frac{\sqrt{K x}}{10}$$

If V is measured in volts:

(3)

$$V = 40\pi R_1 R_2 \rho \sqrt{Kx}$$

For purposes of illustration, assume that $K = 6.6576 \times 10^{-8}$ and that of R1 = 10_1, $R_2 = 1$ and $p = 11.35$; then:

$V = 3.68$ square root of x

If the common potential of the two spheres differs from absolute zero by 3.68 volts, the value of K would be in error by one per cent of the above value, which is that of Boys, unless adequate means are taken to eliminate the effects represented by the final term of Eq. (1)

If V were 8.23 volts an error of 5% would result. If V were 36.8 volts, the two spheres would have no attraction for each other, although both would be attracted by the earth, even if it had the same potential. The attraction of the earth for a gram of lead would then be by (1):

A = 981 - 0.000,000,000,006.

The acceleration of a falling body would be practically unchanged, and would not depend upon the density of the matter of which it is composed, as it would apparently be under the conditions assumed in Eq. (1).

Rainbows falling through an overcharged thundercloud (*3) would repel each other. After the diverging branches of a flash of lightning have penetrated the cloud a new condition has arisen. Overcharged drops of water along the lines of the intricate system of branches of the discharge, have delivered their overcharge to the cloud at the other end of the long flash. These drops are intimately commingled with drops which are outside of the drainage lines. The value of V for these two groups of drops now have opposite signs. The final term in equation (1) then becomes positive, as applied to these groups, and it is much greater than the gravitation term. These drops coalesce as they fall to earth and a brief dash of unusually large drops of rain follows.

(*3: The word overcharged, or super-charged, was in common use more than a century ago, when the one-fluid theory was in general favor.)

(*4: See Nipher: "A Flash of Lightning", *Popular Science Monthly*, Jan. 1912: p. 76; Nipher: *Experimental Studies in Electricity & Magnetism*, pp. 16-17))

In former papers above referred to, an experimental study of explosive effects due to a discharge from a large condenser through a small lead wire was discussed. The wire was sealed within a glass tube filled with coal oil. This work has been continued in a modified form. Four quarter ampere wire fuses of lead were placed in multiple across a gap, 5 cm in length in a line leading from either terminal of an influence machine to a water-pipe system. The other terminal was grounded on a gas pipe. The lead wires were clamped between the leaves of two small brass door hinges, one lead of each hinge being soldered to one of the ends of the rods at the gap. Between the gap in which the leaves were mounted and the ground was placed a large battery jar filled with 4 liters of a solution of common salt. The wire was parted at this point, and the ends were

immersed in this solution which thus formed part of the ground circuit. One of the wires penetrated the liquid to a depth of about half a cm. Between the gap in which the wires were mounted and the machine was a spark gap, between knobs of equal radius. The condenser consisted of 40 large sheets of glass (36 x 36") having upon them 2 x 40 sq ft of tinfoil. The machine was driven by a single-phase electric motor. Below the lead wires a sheet of white paper was laid upon a plate of glass.

It was found that there was a marked difference between the effect of the positive and the negative discharge, or the compression wave, would cause the lead wire to fuse and drop in hot globules upon the paper below. The effect upon the paper is shown in Plate XLIV, Figure 1. [Not available]

With the same adjustment, the positive discharge3 causes the lead wires to rise in a cloud of dust. If the paper were placed 3 cm below the wires, it would usually be practically unaffected when the positive discharge was used. In a few cases, as in Figure 2, it was slightly discolored by the lead fumes.

Of course the discharge could be made greater, so that either discharge would cause the lead to be dissipated in a cloud. It could be made less, so that fused metal would fall upon the paper when the positive terminal was connected with the ground containing the wire. In all cases the cloud effect was the more marked in the case of the positive discharge, and the fused metal falling upon the paper was less marked.

In case of the positive discharge there is of course a heat effect. Part of the result is due to this cause. But if we are to consider the positive terminal as an exhaust terminal, into which the negative electrons are suddenly drained and thence into the positive sheets of the condenser, we may explain the result as an explosive condition which is suddenly impressed upon the lead. When deprived of negative corpuscles, each atom repels every other. The negative term in question (1) has become very much greater than positive, when applied to inter-atomic attraction under these conditions.

The negative discharge, which is to be regarded as a compression wave could not give a super-charge to atoms within the wire, causing them to repel each other. The super-charge is on the outside of the wire. The one-fluid theory seems to furnish a more rational explanation of these phenomena than the two-fluid theory, as in the case in the phenomena of the Crookes tube.

Some work has been done in the examination of the effect of the electrification of air within a glass vessel, upon the pressure of the air on the walls of the containing vessel. A large 3-necked Wolff's bottle was used, the 3 openings being provided with rubber stoppers which had been treated with vacuum wax. The bottle had a volume of 9.6 liters. Through the central stopper was passed a copper wire to which were attached 150 pins whose heads were soldered to one of its faces. This many pointed terminal could be placed directly in front of either of the large knobs of the machine, at a distance of 10 cm, the other knob, or terminal, being grounded.

A U-shaped water gauge was mounted in another stopper of the flask. In the third stopper of the flask a tube with a bulb containing calcium chloride was mounted, this tube being provided with means for connecting the confined air with the outer air. The condensers were wholly removed from the machine. The glass bottle was placed upon a sheet of heavy plate glass.

When the discharge-knobs of the machine were near enough together so that the brush discharge between them was accompanied by faint disruptive effects, the pressure within the flask could be increased by about 2 gr-wt per sq cm, the effect of the negative electrification being somewhat greater than that of the positive. When the knobs were far enough apart to prevent disruptive

discharges, no luminous effects being observed within the flask, the change in pressure due to either terminal was reduced to 1 and 2 mm as shown by the water gauge. After the pressure due to electrification of the air had reached a final limit, a transfer of the may pointed collector of the front of the other terminal, would result for a time in a slow decrease in pressure, and then in a slow increase to the former limit. The decrease in pressure did not begin until the discharge from the other terminal had begun. Heat effects had been practically eliminated.

If the gas contains moisture a permanent decrease in pressure at once results, due to condensation of vapor upon the sides of the vessel.

These results seem to indicate that there is an electrical condition of the gas, for which the Boyle-Gay-Lussac constant is at a minimum. When this condition is reached, the second term of equation (1) is zero, as applied to molecules of gas.

An attempt has been made to determine whether or not the value of the gravitational term of Eq. (1) can be affected by electrical action, when the effect represented by the final term is eliminated. The apparatus used was a modified form of that used by Cavendish. The suspended masses consisted of 2 lead tubes, each being about 15 cm length, each having a mass of 50 grams. They were mounted around the ends of a bras tube 91 cm in length, and having a mass of 30 gr. This tube was suspended upon 2 loosely twisted threads of silk fibers, 180 cm length, whose distance apart was approximately 0.4 cm, the twist was removed from these threads by hanging upon each a mass of 65 grams. This formed a very sensitive bifilar suspension. The suspended masses were wholly surrounded by a metal shield of rectangular form 10 x 12.5 cm in cross section. The suspension fibers were enclosed in a metal tube, having a torsion head at the top, thus providing means for properly adjusting the position of the brass tube. The ends of the rectangular shield were provided with metal caps, fitting closely into its ends. They entered the shield a distance of 2.5 cm. An opening at the middle of the shield, in front of a mirror mounted upon the suspension wire, served for observation of position by means of a telescope and scale. This opening was covered by a sheet of glass which was sealed to the shield by means of sealing wax. The window was covered with a metal wire screen having about 5 wires per running cm. The mirror was observed through this wire screen, the telescope being focused upon the scale at the telescope. A change of one scale division represented a change of 2.36 minutes of arc in the position of the suspended tube. The suspended masses and the brass tube on which they were mounted were surrounded by sheets of asbestos paper, which fitted into the caps at the ends of the shield, and fitted loosely the interior of the shield. These two linings formed extensions of the end caps and were intended to prevent a convection of the air within the shield.

The larger masses each consisted of two 50-pound weights placed one upon the other and mounted upon heavy columns of rubber. They were separated from the metal shield by a space of about 2 cm. In this space was placed a sheet of paper and 3 layers of asbestos paper.

The shield was mounted upon a heavy piece of timber and rested directly upon a sheet of glass. It was also wrapped with asbestos paper. The long suspension tube was held in stable position by 3 heavy silk cords attached to surrounding cases, and loaded with a series of distributed masses varying from 50 to 100 grams each. The metal shield was loaded with two 10-pound masses of iron and its sides were clamped with wooden clamps in order to quiet any vibrations in the shield. The large iron masses and the metal shield were connected with each other by large copper wires, leading to a spark-knob mounted upon a massive table. The floor of the room was of reinforced concrete. The discharge terminal was connected with the influence machine in an adjoining room, by means of brass rods hung upon silk cords. The machine was operated by a synchronous electric motor. The discharge knobs at the machine were separated so that no

disruptive discharges were possible. One terminal of the machine was grounded. There were no condensers on the machine terminals.

The time interval of a to and from vibration of the suspended masses was 485 seconds. When at rest there appeared to be no disturbance of any kind. The reading would sometimes remain constant for hours. At other times the reading slowly changed. It often varied throughout a day through 20 scale divisions. It was found that the large masses appeared to attract the suspended masses with a varying force, even when the former were hung from the ceiling above. Sometimes they appeared to repel the suspended masses. These varying effects were finally traced to very moderate changes in the temperature of the room. It was found that the flame of a wax candle, placed 14 inches from either of the suspended masses, exerted a marked apparent attraction for them. When a sheet of glass and two sheets of asbestos paper were placed between the candle flame and the metal shield, it being provided with a wrapping of asbestos paper in addition to the inside lining of the same material, an apparent attraction resulted. Fluctuations in the flame of the candle due to the condition of the wick produced observable effects. When the outer wall of the screen was rising in temperature more rapidly on one side of the suspended mass than on the opposite side, this mass moved towards the warmer side. This was apparently due to the convection effect of air within the lining of the metal screen.

The suspended rod bearing the small masses was below the central axis of the enclosing shield. If one side of the shield was warmer than the opposite side the suspended rod would be in a slowly drifting current of air, which would urge it towards the warmer side of the screen, or away from the colder side. The temperature of the large masses lagged behind that of the screen in the small daily changed in the temperature of the room.

The effect of a noiseless discharge from the pin-point terminal into the air around the knob connected with the screen and the large masses, was to produce an apparent decrease in the attraction of the large masses for the suspended masses. This result was obtained when no trace of disruptive discharge could be detected. After the extreme displacement thus produced had been reached, the distance between the pin-point terminal, and the knob connected with the shield and the large masses, was increased from 15 to about 90 cm, the charged bodies being then grounded. This was done by means of a fine wire attached to an insulated rod, which could be laid upon the floor of the room, or lifted into contact with a rod, one end of which rested upon one of the large masses. The pin-point terminal was meantime made to face another grounded conductor. The suspended masses then swayed to the other extreme position during the next four minutes. By a repetition of this operation, the arc of vibration could be increased from 1 or 2 scale divisions to 26 in the interval of an hour. The average of the extreme readings of consecutive vibrations, usually showed slow progressive changes of 2 to 5 scale divisions per hour. Sometimes the average reading showed a decrease and sometimes an increase. The results were of the same order of magnitude whether the masses were connected with the negative or with the positive terminal of the machine, although most of this work has been done by the positive "discharge".

It was suspected that this result might be due to a slight rise in the temperature of the walls of the metal shield. If this were the case it must be assumed that while the gap at the pin-point terminals was least, the rise in temperature was least in that part of the sides of the metal screen facing the large external masses.

In order to examine this influence, a delicate air thermometer was extemporized. The bulb consisted of an oil-can having a capacity of 4.5 liters (1 gal). Connected by a rubber hose with the nozzle of the can was a horizontal tube of glass, having a length of 75 cm and an internal

diameter of 0.76 mm. Within this tube was a short column of water, serving as an index. The entire device was insulated upon glass supports. A candle flame 20 inches distant from the can was electrified and in electrified contact with the large masses and shield, no change in the position of the index column could be detected when observed by means of a telescope.

The large masses were then wholly enclosed in two metal boxes, from which the masses were insulated. The masses rested upon rubber blocks placed upon the bottom of the boxes, and each box was mounted upon rubber blocks which rested upon plates of glass. The masses were in the same position as in the work described above. The boxes were separated from the shield, enclosing the suspended masses by the plates of glass and the asbestos paper.

The two metal boxes and the metal shield were then electrified precisely as has been done before. It was then found impossible to increase the arc of vibration of the suspended masses, although the operation was continued for several hours. If the former results had been due to heat effects, they should have produced the same results in this case. The large masses were removed from the enclosing boxes. The empty boxes and screen were then electrified as before.

No change in the amplitude of vibration could be produced.

These results seem to indicate clearly that gravitational attraction between masses of matter depends upon their electrical potential due to electrical charges upon them. To assume a special case, such as exists when the gravitation constant is being determined, Newton's law holds only when the common potential of the two bodies is such that their gravitational attraction for each other is at a maximum. If the two masses are not separated by a metal shield and their common potential is that of the earth, these masses and their common potential is that of the earth, these masses will repel each other by a force represented by the final term in Eq. (1) and the value of K will also be diminished, if the above conclusions are correct. If the two masses are separated by a metal shield, this final term will be eliminated, but the value of K will be diminished and may seem to be variable, if there are local variations in the potential of the earth. By adjusting the potential of the attracting masses by well known means we may hope that the real value of K and the absolute potential of the earth may be determined. This is a problem for the future to solve.

In the work discussed in this paper an effort has been made to eliminate heat effects from all sources. It may be that alternating discharges from a high potential transformer would produce more marked effects than have been observed by the methods above described. The surging of negative electrons within the large attracting masses would be greatly increased. This would also involve heat disturbances, the effect of which would cast a doubt upon the results. Under the conditions in which this work was done the amplitude of vibration of the suspended masses sometimes changed in a way that seemed to discredit the above conclusions. It was finally found that variations in the illumination of clouds in the northern sky produced marked effects upon the position of the suspended masses. The apparatus was fifteen feet distant from five large windows in the north wall of the room. The variation in radiation from such clouds was occasionally followed by a marked change in the amplitude of consecutive vibrations. After such disturbances and others not here referred to had been eliminated, there still remained distinct evidence that the value of the gravitation constant as it has been determined, is dependent upon the electrical potential of the attracting masses, when the effect represented by the final term in equation (1) is wholly eliminated by a metal screen.

Plans are now being prepared which will, it is hoped, result in a determination of the change which can be produced in the value of the gravitation constant, by electrification of the larger masses.

Figure 1: Fusion of lead wire by negative discharge. [Not available]

Figure 2: Explosion effects due to positive "discharge". [EV's ? Not available]

Trans. Acad. Sci. of St. Louis **XXIII (4): 177-193 (July 28, 1916)**

Gravitational Repulsion

by

Francis E. Nipher

In a former paper published by the Academy on July the following passage may be found: (*1)

(*1: *Trans. Acad. of Sci. of St. Louis*, XXIII (4): 173-176; July 28, 1916)

"These results seem to indicate clearly that gravitational attraction between masses of matter depends upon electrical potential due to electrical charges upon them."

Every working day of the following college year has been devoted to testing the validity of the above statement. No results in conflict with it have been obtained. Not only has gravitational attraction been diminished by electrification of the attracting bodies when direct electrical action has been wholly cut off by a metal shield, but it has been made negative. It has been converted into a repulsion. This result has been obtained many times throughout the year. On one occasion during the latter part of the year, this repulsion was made somewhat more than twice as great as normal attraction.

The large masses used in this work were spheres of lead ten inches in diameter. They were mounted upon blocks of dry wood, which were mounted upon caster-roller bearings. The wheels rested upon heavy sheets of hard rubber. The suspended masses were two spheres of lead, having a diameter of one inch, mounted upon the ends of a brass tube. Their distance apart, from center to center, was 91.5 cm. They hung upon two untwisted threads of silk fibers, forming a bifilar suspension. The length of the threads was 179 cm, and the distance between them was about 3.4 mm. Near the top of the long metal cylinder enclosing these suspension fibers, was a lateral brace formed of two bars of hard rubber, about 30 cm in length. The ends of these bars formed a right angle against which the vertical suspension cylinder was pulled. These rubber bars formed the ends of two long bars of wood attached to the tops of instrument cases along adjoining sides of the room. The bars were also supported by a framed structure. Silk cords attached to the cases ran along the two bars and were tied to the suspension cylinder. Weights distributed along these cords served to hold the cylinder against the ends of the rubber bars. Vibrations of the suspension cylinder were thus wholly eliminated. The torsion head forming the top of the cylinder was provided with a rod which extended radially outward to a distance of about 20 cm. By this means the torsion head could be turned in order to put the suspended masses into vibration. The top of the suspension cylinder had a similar rod clamped to it having an upward projecting stop, by means of which the torsion head could be returned to the original position. Change in the temperature of the air within the shield resulting in a change in volume was provided for by the outflow or inflow around the torsion head.

The enclosing case was of the general form used by Cavendish. In the early part of the year it was formed wholly of metal. It rested upon insulating blocks of rubber, which were mounted upon two long pieces of timber having a cross section of 4x4 inches. These timbers rested upon a massive table, which was on a floor of reinforced concrete within a building having granite walls. At the central part of the metal shield the dimensions were 5x5 inches. A narrow slit on one side covered by a small plate of glass sealed to the shield, served for observing the movement of the suspended masses by means of a telescope and scale. At the outer ends of the

shield, the lateral dimension was about 15 inches. This form was chosen in order that the suspended masses and the brass tube upon which they were mounted could be inclosed by a cylinder of copper wire gauze, between which and the outer screen was very loosely packed cotton fiber. A thin layer of cotton was placed at the ends of the screen, being also held in place by wire netting. This was designed to diminish convection effects.

The body of the observer was wholly below the level of the table. Radiation of heat from the head to the screen was cut off by sheets of heavy cardboard.

The two rooms used for this work were wholly disconnected from the heating system of the building. During the day the temperature of the large masses was usually slightly lower than that of the shield around the suspended masses. This temperature difference never exceeded 1.5° C.

The large masses were placed at the ends of the screen or shield in line with the rod upon which the small masses were mounted, in order to determine their effect upon the time of vibration of this bifilar pendulum. The large masses and screen were in direct metallic connection, and the air around them was electrified by a discharge from pin-points. A disc armed with 150 pins was placed with the pin-points 4 cm. from each of the large masses. A noiseless discharge was delivered from the points of the pins.

Let T represent the time of vibration when the masses were away.

Let T_1 represent the time of vibration when the masses are in place.

Let T_2 = the time when the masses and screen are electrified. Then:

(1)

$$T = 2\pi \sqrt{\frac{I}{m\,g\,\frac{d^2}{l}}}$$

Here m is the suspended mass, $2d$ the distance between the two silk fibers on which it is suspended, and l their length. I is the moment of inertia.

When the large masses are in place:

(2)

$$T_1 = 2\pi \sqrt{\frac{I}{D + 2\,b\,G\,\frac{M\,m'}{r_2}}}$$

Here D is the directive constant of Eq. (1), b the distance between the centers of the two suspended masses m', and, and r the distance between the suspended masses and the large masses M. The equivalent of the brass rod is included in m'.

When the large masses are electrified, if the time of vibration is increased to T_2 and we assume that this is due to a decrease in the value of the gravitation constant G, then:

(3)

$$T_2 = 2\pi \sqrt{\frac{I}{D + 2\,b\,G\left(1 - \frac{n}{100}\right)\frac{M\,m'}{r^2}}}.$$

From these equations:

(4)

$$\frac{n}{100} = \frac{T_2^2 - T_1^2}{T^2 - T_1^2} \times \frac{T^2}{T_2^2}$$

The time of vibration was determined by means of a chronograph belonging to the department of astronomy of the University. The key was snapped when the mean reading passed the cross-hair of the telescope. The mean reading was obtained from the reading of the four extremes of the two complete vibrations which immediately preceded. The values here given are the mean of six complete to and fro vibrations and the probable error does not in any case exceed 0.25 sec.

Observations March 10, 1916:

T = 623.0 sec.
T_1 = 614.5 sec.
T_2 = 625.0 sec.

By Eq. 4, $n/100$ = 1.23

When T was determined the temperature of the air the room was 15.5° C = t_a.

The temperature of the screen was t_8= 15.2° C.

When T_1 was determined,

t_a = 17.4° C
t_8 = 17.4° C

The temperature of the two large masses was 16° and 16.6°.

These values were determined by means of four thermometers reading to tenths of a degree. The bulbs were placed in contact with the masses, and covered with a layer of cotton batting.

When the readings for T_2 were finished,

T_a = 18.0° C
T_8 = 17.9° C

The temperature of the large masses was 17.7°and 17.8°.

On a former occasion, when the bifilar suspension different, it was found that placing metal vessels containing a liter of water having a temperature of 28° C. at the beginning of the experiment, and 24° at the close, in positions occupied by the large masses, the temperature of the air and shield being 13°,8, the value of T was increased from 644.2 sec. to 652.5. The warm vessels were in contact with the shield.

When the metal vessels contained water and ice, temperature of the air and shield being 12.0°, the value of T was decreased by 25 seconds.

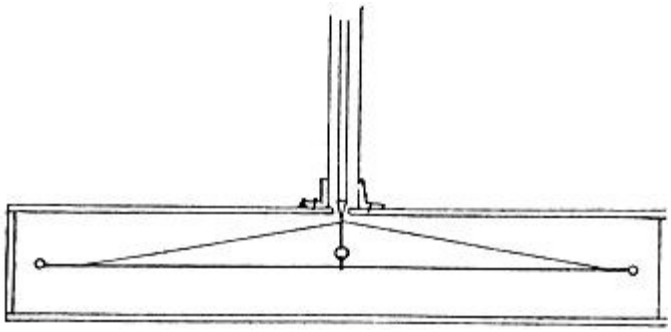
These results seem to indicate clearly that convection of the air within the shield had no material effect upon the values of the quantities used in computing the value of *n* in Eq. 4.

It apparently follows that the value of the gravitational constant was made negative by the process described. Attraction was converted into a repulsion. The influence machine was unusually active by reason of fresh dry material in the case in which it was enclosed. On other days the value of *G* was decreased by 16, 23, 27, 69, 77, 134 and 184 per cent of its initial value. It is not claimed that these are results of any high degree of precision. During the first week while the bifiar method above described was being tested, the time of vibration during a period of two hours was found to be very constant. For example, in the first determination made on October 23, the mean position of the suspended masses was determined from readings of the extremes for several vibrations. The key was then snapped for six readings while the mean reading passed the cross-hair of the telescope. The mean reading was determined in each case by a computation from previous readings. It was found to be very constant. After lunch the same operation was repeated. This gave six readings of the time interval of 7 complete to and fro vibrations, with data for determining the probable error of the mean. The result was 653.45 +- 0.062 seconds. The probable error was sometimes three times as great as the above value and the mean value varied from the above value on other days by between one and two seconds. An error in the value of n might amount to three or four per cent. The cause for the variations proved to be a difficult problem. The silk threads were very loosely wound, and before they were put in place a weight equal to half the weight of the entire suspended mass was hung upon each of them for several days. They then seemed to be in permanent condition. The breaking stress was about five times that which was thus applied to them.

The causes for the variation in the time of vibration were thought to be possibly due to a breaking of some of the fibers in the threads which might result in an entanglement between the two threads, or which might result in an unequal division of the load between them. It was sought to eliminate the former source of error by applying vaseline to the threads. This did not appreciably change the result. It was finally decided to check the results above described by placing the large masses on alternate sides of the suspended masses and observing the deflection doe to gravitational attraction.

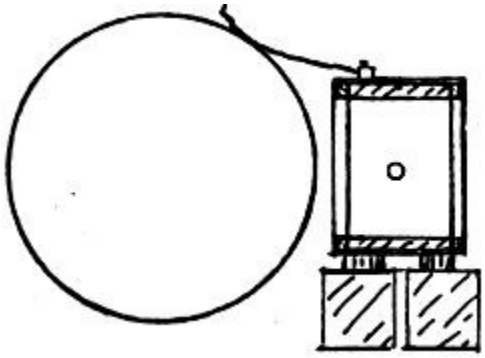
In order to maintain equality of stresses in the two threads, which had been hung around a hook attached to the torsion head, they were hung around a pulley, having a diameter of one inch. Below were two adjustable pulleys. The threads approached each other around these two pulleys, and their distance apart could be so varied as to make the threads parallel within the suspension cylinder. The metal shield before described was replaced by one having equal width from end to end. The top, bottom and ends were of wood 1/8 inch in thickness. A sketch of this wood frame is shown in vertical section in **Figure 1**.

Figure 1 ~



This wood frame was varnished with shellac and the points of contact of its parts were closed. The sides this frame were each closed by two layers of heavy cardboard outside of which was a sheet of flexible tinned iron. They were clamped to the wooden frame by means of wood bars screwed to the bottom, top and ends. The edges of the cardboard were then scaled by means of beeswax applied by means of a hot iron. The entire device as thus described was then enclosed by a metal shield. A cross section through one of the suspended masses is shown in **Figure 2**.

Figure 2 ~



This outside metal shield was not air-tight. It was formed of sheets of flexible tinned iron, the parts of which overlapped. They were tied in place by windings of twine. It was considered an advantage to allow convection currents which might form in the layer of air between the two sheets of metal forming the sides of the enclosing case some opportunity to escape into the outer air.

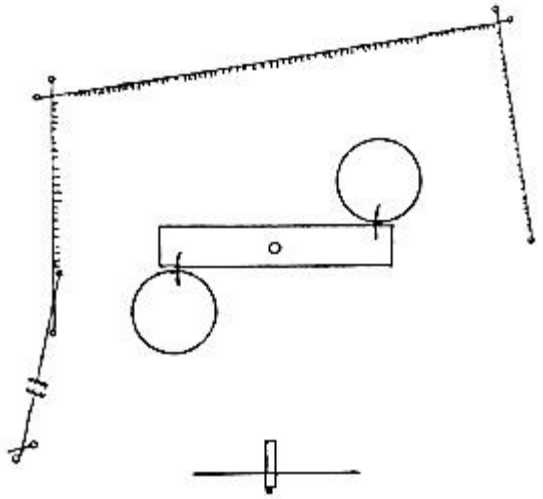
The large masses *M* were thus separated from the suspended masses *m'* by two superposed sheets of cardboard and a sheet of metal, which were clamped and sealed to the wood frame of **Figure 1**, a layer of air about 0/8 inch thickness, and the outer sheets of metal, forming part of the metal shield enclosing the entire device.

Both of the masses *M*, and the shield around the suspended masses, were insulated as before described. The large masses and the shield around the suspended masses were connected by means of large copper wires. Between the masses *M*, and the shield were sheets of glass, not shown in **Figure 2**.

In the work to be described, the air around the large masses and screen was electrified by a noiseless discharge from 800 pin points which were mounted in strips of metal hung upon

insulated metal rods three feet from the large masses and screen. A sketch of this arrangement as shown in **Figure 3**. The sheets of metal which carried these pins were punched with small holes, through which the pins were inserted and the heads were then soldered to the sheets of metal, which were then hung upon the insulated rods by metal hooks. At one end this line of rods terminated in a disc of metal upon which 150 pins were mounted. Facing this disc was a duplicate, the points of the pins in the two discs being three or four inches apart. This last named disc was directly connected with one terminal of an influence machine in an adjoining room, the other terminal being grounded on a water pipe. There were no condensers attached to the machine, and the knobs were widely separated. There were no gaps in the line of conductors. The machine was enclosed in a glass case containing drying material, and it was driven by a single-phase motor. Placing the large masses in the position shown in **Figure 3** at the time when the work to be described began, increased the scale reading by 0.40 cm.

Figure 3 ~



An illustration of the results obtained is shown **Plate XLV**. In each case the masses had been grounded during the preceding night. The scale was displaced in order that the two diagrams might be shown on the same plate, without interference. On the lower diagram the arrangement of apparatus was as shown in Figure 3. The hour of the day is laid off upon the horizontal axis. The scale reading in cm. is along the vertical axis. One mm represents an angle of 2.6 minutes of arc. The negative terminal was applied at 9:38 a.m. On the diagram the arrow indicates the time. At 10:12 a.m. the terminals were reversed, an operation which required a few seconds of time. At 11:30 the machine was disconnected. There was evidence shown in the drop in the reading at 11:20 that the reading would begin to decrease. The upper diagram of this plate shows results obtained on May 4. Here the positive terminal was first applied at 9:35 a.m. The terminals were reversed at 10:24 and the machine was stopped at 11 :20, the readings being continued to 12:05 p.m. In this work the conductors upon which the 800 pins were supported were directly connected with the large masses and shield.

When direct contact was made between the pin-conductors and the large masses, the changes took place more rapidly than when the air surrounding the masses was supercharged with

negative corpuscles emitted from the pin points, or when the reverse action took place, this alone being depended upon to change the potential of the masses. The most interesting feature of this work is the complete elimination of the possibility that the apparent decrease in the attraction between these masses was due to the convection currents of air resulting from heat effects. Reversing the terminals would not reverse the heat effects.

The possibility that one terminal of the machine produced greater heat effects than the other, the deflecting effect being decreased when the terminal producing the lesser heating effect was applied is also eliminated. It matters not which terminal is first applied. The result is the same, and has been obtained many times.

During the afternoon of May 4 the operation represented in the upper curve of Plate XLV was repeated, the positive terminal being first applied. A result of precisely the same kind was obtained.

The upper curve of **Plate XLV** also means that the gravitational attraction between the masses at 9:35 a.m. had been decreased by about 110% at 10:10 a.m. Gravitational attraction had been decreased to zero, and had then been converted into a repulsion. An hour later it had regained its initial value. On the afternoon of June 1, 2:30 p.m., it was decided to change the electrical condition of the suspended masses. One of the end caps forming the outer metal shield of Figure 2 was removed. A hole which had been bored through the wood frame, and which had been closed by a rubber stopper, was opened. A glass tube was passed through the opening, about two centimeters beyond the inner surface of the wood frame. A copper wire to the end of which the head of a pin had been soldered, was passed through the tube, the point of the pin projecting slightly beyond the end of the tube.

The wire was about six inches in length. The apparatus was arranged as shown in **Figure 3**. The positive terminal of the machine was used in draining negative corpuscles from the air within the shield around the suspended masses. A slow change of 1.2 cm. or 12 scale divisions in the scale reading was produced. The terminal was disconnected when this deflection had been produced and the machine was stopped. The tube was removed, the end cap of metal was replaced and the large masses and shield and the pin-point conductors were grounded until the next day. The mean rending had not been appreciably changed.

At 10:25 a.m., June 2, readings were taken until 10:43 a.m. The suspended masses were at rest. The positive terminal was then applied. The result is shown in Plate XLVI. The arrangement of the apparatus was that shown in **Figure 3**. A sudden decrease in the attraction occurred. It was so sudden that forced vibrations were impressed upon the suspended masses. The vibrations were small, and only occasional readings of consecutive extremes were recorded. At 2:20 p.m. the terminals were reversed and at 2:32 p.m. direct contact of the pin-point conductors and the large masses and shield was made.

The attraction at once increased very rapidly. The absolute zero of potential was reached and passed in a less time than that of a semi-vibration. Forced vibrations were impressed upon the suspended masses as the attraction began to decrease. These vibrations were observed, and the extremes were read until 3:30 p.m. The masses were then being repelled by a force nearly twice as great as the initial gravitational attraction. Direct contact between the discharge points was removed, but the masses were not grounded. On Monday, June 4, at 9:20 a.m., the masses were vibrating over a very small arc (about one scale division). Readings were taken at some of the extremes of vibration, which were sufficient in number to show that the mean reading was constant until 11 a.m. These readings are represented in Plate XLVII. The masses were still repelling each other, with a force about 50 per cent greater than the initial attraction on the

morning of June 2. This conclusion seemed beyond belief at the time but subsequent results on that day seemed to make it a necessary conclusion. At 11:03 a.m. the positive terminal was applied and direct contact between the large masses and the pin-point conductors of **Figure 3** was made. The time is represented by the arrow marked +DC on Plate XLVII.

At once the attraction began to increase. The masses were swaying in the opposite direction at the time when contact was made. A maximum reading was obtained at 11:18 a.m. and the masses swayed in the opposite direction during the next 14 minutes. Forced vibrations were again impressed upon the suspended masses, but they were less violent in character than those at the close of the observations; represented in Plate XLVI. At 12 observations were discontinued until 12:48 p.m., when the reading showed only a slight decrease. At 1:00 p.m. the terminals were reversed and the direct contact was removed. The conditions then were as represented in **Figure 3**. At this time the apparent decrease in the initial attraction which existed at the beginning of the observations on June 2, was about 340 per cent. In other words the apparent repulsion was then more than twice the initial attraction. This conclusion seems to be fully justified by the amazing increase in the attraction which at once resulted. At 1:53 p.m. direct contact between the pin-point conductors and the shield and large masses was made by dropping a wire into position. It was removed at 2:02 p.m. Forced vibrations were again impressed upon the suspended masses. The machine was stopped at 2:19 p.m. and I was called away for an bour. A few readings taken between 3:12 and 3:22 p.m. shown at the close of Plate XLVII indicate that the attraction had then approached closely to the initial value on the morning of June 2.

It will of course be understood that no attempt has been made to secure results of precision in this work. The only aim has been to determine whether or not it would be justifiable to construct the much more expensive apparatus which will be required for such results. The suspended masses must be capable of being electrified independently and the enclosing walls must surround them in symmetrical form, so that their inductive action will not produce deflection of the surrounded masses. If they are suspended in highly rarefied air, it may be necessary to use a metal wire rather than a quartz fiber, which must then be attached to an insulated torsion beam. A modified form of the apparatus used by Boys will be required. The necessity for such a construction seems to be justified by the evidence already obtained, that if the potential of either of the attracting masses M and m' is zero absolute, gravitational attraction between them will not be affected by varying the potential of the other mass. The gravitation, constant as it has been determined by methods which made use of some form of the Mitchell-Cavendish apparatus, would have a maximum value when either or both of the masses had a potential of zero absolute.

Neglecting the inductive effect which electrified masses have upon each other, it is possible that the amended equation for gravitational attraction between them is:

$$A = K \frac{m\,m'}{r^2} - K' \frac{Q\,Q'}{r^2}$$

It seems possible that the effect of the charges Q and Q' upon gravitational attraction between the masses m and m' may be a surface effect. If so the values of Q and Q' may be replaced by RV and R'V', where R and R' are the radii of the two masses and V and V' their potentials due to those charges.

The above equation may also be written:

$$A = K\left(1 - \frac{n}{100}\right)\frac{m\,m'}{r^2}$$

Here it is assumed that the masses are so electrified as to diminish their normal attraction for each other by n per cent. From these two equations the values of m and m' being replaced by their values in terms of volume and density.

$$K' = K\,\frac{n}{100}\,\frac{16}{9}\,\frac{\pi^2\,\rho^2\,R^2\,R'^2}{V\,V'}$$

If this equation really represents the conditions imposed upon the masses, it appears that for any given decrease in gravitational attraction the potentials of the masses must be directly proportional to the surface areas of the masses. Small planets having high and perhaps varying potentials might not follow Newton's law. The value of *n* would be large and variable.

In the work represented in Plate XLVI, if we assume that when n was l00, the attraction between the masses being reduced to zero, the potential of the large masses was 30,000 volts, or 100 E.S.C.G.S. units, and that of the suspended masses was 10 volts or 1/30 E.S.C.G.S. unit, then the last equation would give for *K*':

K' = 165800 *K*

This result is based upon assumptions and estimates. One inference may be drawn from it. There is nothing here to indicate that the force whose action is represented by Newton's term, should not be the main factor in determining the motion of the masses in our planetary system.

The large masses represented in **Figure 1** were replaced by boxes of metal, filled with loose cotton batting. They rested upon insulators. They were separated from the screen by sheets of glass, and were put in metallic contact ,vith it by means of copper wires. Precisely the same treatment was applied to this system as was given when the large masses were in place. No change in the position of the suspended masses could be detected.

The large masses being in position as before described, spring contact brushes were fastened to the blocks of wood upon which the large masses rested. They made contact with the large masses at points midway between the top and bottom of the spheres. A direct current of 20 amperes was sent through the two large masses. The axis of the line of flow was in one case practically coincident with the line through the centers of gravity of the two masses nearest to each other. The direction of flow was either from the outside contact, to the one nearest the screen, or the reverse, the direction of flow being reversible by means of a double switch. The screen was insulated from the two large spheres. No effect upon the suspended masses could be detected. If any effect was produced it was very small. The large masses were turned 90° in position, with a like result.

An alternating current of 20 amperes was applied. No effect could be detected when the masses were in the latter position. When the lines through the points of contact with the brushes with the large spheres was coincident practically with the line through the centers of gravity of the two masses nearest to each other, the gravitational attraction was quickly reduced to zero, and made negative. When the double switch was opened, so that the large masses were wholly separated from the source, and the masses were grounded it required between two and three hours for the large masses to recover from the shock which they had received. This has been repeated many times, with no discordant results. It may be that the parts of the large spheres which are most

affected by the alternating current are those parts near the brushes. If there are heat effects, they tend to oppose the observed effect. Burning candles replacing the large masses cause a change in reading in the opposite direction from that of the alternating current, the glass plates being removed. This is due to convection currents within the screen.

The work here described has been done in a private laboratory in the second story of Eads Hall, now occupied by the physics department of Washington University.

My thanks are due to the Carnegie Institution of Washington for meeting the expense of this work.

Plate XLV: Variation in Gravitational Attraction

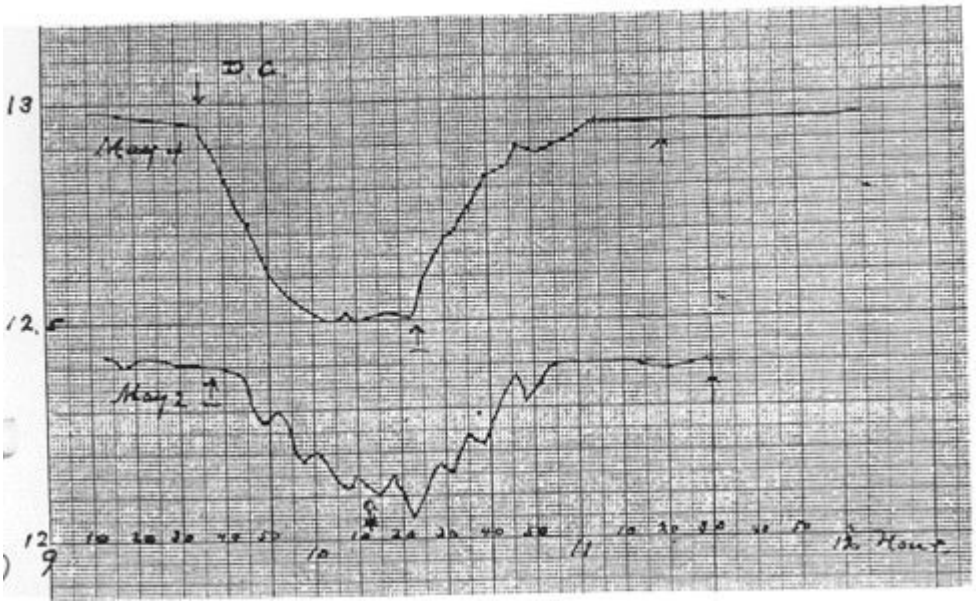


Plate XLVI: Variation in Gravitational Attraction [Not available]

Plate XLVII: Variation in Gravitational Attraction [Not available]

Trans. Acad. Sci. of St. Louis **XXVII: 383-387 (March 2, 1920)**

New Evidence of a Relation Between Gravitation & Eelctrical Action, & of Local Changes in the Electrical Potential of the Earth.

by
Francis E. Nipher

In the work to be here described, the apparatus used was a modified form of that used by Cavendish, as shown in the former paper, published by the Academy of Science of St. Louis, Vol. XXIII, pp. 183-185.

The wood frame was in this case covered with tin-foil, within and without. The sheet metal forming the sides of the shield were clamped to the wood frame, by bars of wood which were also covered with tin-foil. All joints were sealed with wax before the tin-foil was put in place.

The whole shield was then surrounded by two end caps of metal which meet at the middle or the shield and are scaled together by means of tin-foil. A layer of air was thus formed between the two metal shields surrounding the suspended masses. Either of these two metal shields was considered ample protection to prevent the suspended masses from being acted upon electrically by the large masses. The layer of air between the two shields was designed to diminish convection effects within the shield due to changes in the temperature of the room, and changes in the temperature of the air within the room were made as small as possible by cutting off all sources of artificial heat. It did not usually vary more than 1.5 degrees C. during the day. The temperature was determined by means of a thermometer placed near the large masses. The reading was by means of a telescope. The reading could be made accurately to tenths of a degree C and hundredths of a degree could be estimated with fair precision. The air within the shield was electrically charged by means of a wire armed with a pin which was thrust through the end of the shield about an inch above the level of the suspended masses, and was sealed in place. The inner end of the tube was drawn to a small diameter, being only large enough to admit the end of the pin. This could be withdrawn at any time and the outer end of the tube could be covered with a metal tube which was closed with a metal plug at its outer end.

Convection effects, due to changes in temperature, have been very carefully studied. When the masses have not been electrically charged for several days, the rise in the temperature of the room during the day caused a very slow increase in the scale reading which determined the position of the suspended masses. This change in position decreases the distance between the suspended masses and the large masses. When a door opening into the hallway was opened for four minutes this change is larger and more abrupt. When an outside window was opened, admitting cold air, a sudden decrease in the reading results.

The room containing the apparatus was always entered from an adjoining room, from which heat from the heating system was wholly cut off.

In order to decrease convection effects, the large masses and shield were covered on all sides with a pile of cotton batting, forming a layer of about 6 to 8 inches thickness. This was permissible by reason of the fact that the electric machine in the adjoining room was discarded as a source of electricity. It was replaced by the earth, which had been found to be equally effective, and which has a much greater capacity. The large masses and shield, and when necessary, the injection pin were connected by wire with a copper lightning rod on the outside of the building. This rod formed the ground connection for a steel tower used for wireless. Its top was 100 feet above the ground. This tower is mounted upon the roof of the physics building, the walls of which are red granite. The room containing the apparatus is on the second floor of this building, and below the tower.

Twelve copper wires about ten feet in length were soldered to the lower part of the lightning rod, and spread over the ground, their ends being injected a few inches into the soil. The wire leading from the masses within the building to the rod was also soldered to it. Connected with this wire within the room containing the gravitating masses were metal rods surrounding the apparatus which were hung sheets of metal to which were attached about one thousand pins. Small holes were punched through the metal, the pins were inserted, and the heads were soldered to the metal, This was intended as a means to put all of the air in the room in an electrical condition as near uniform as possible.

With such an apparatus a determination of the gravitation constant would be utterly impossible, the position of the suspended masses changes from day to day and from night to day by greater amounts than was at any time possible when the plate glass machine was used for the

electrification of the masses. Their position depends upon the weather and upon the moisture in the surface of the earth. The changes were often greater than was ever caused by the removal or replacing of the large masses. Results obtained on December 12 last are alone sufficient to establish the fact that enormous local changes in the earth's potential are constantly occurring, and that these changes produce variations in gravitational attraction between the large masses and the suspended masses.

On December 5 and 6 over an inch of rain and sleet fell, and on December 8 and 9 there was a light fall of sleet. The minimum temperature gradually fell from 28° on the 5th to 1° on the 10th. The ground was covered with a thin layer of ice and snow on the 12th. On that day the morning temperature was 20° but rose to 56°. The ground around the lightning rod between the building and a walk about 12 feet from the building was very dry, having been shielded by the building. During the forenoon the large masses and the injection pin for electrification of the air within the shield were connected with the lightning rod. Between 8:50 a.m. and 11:45 p.m. the scale reading decreased very slightly but with no vibrations. The temperature of the air around the shield increased by 1.5° C. The injection pin was then withdrawn and the glass tube was covered with the metal cap. Vibrations of the suspended masses at once began. The scale reading varied through about three divisions of the scale. This amplitude had diminished to about two divisions of the scale at 1:20 p.m. The time of a complete vibration was about 9 minutes. The frozen ground outside of the walk was then covered with a thin layer of water. Eight buckets of water were splashed over the ground around the lightning rod, covering the area over which the copper wires were spread, this wet area thus formed being finally connected with the wet ground beyond the walk. The scale reading abruptly diminished during the next three vibrations. The change in the average reading was about 80% of the change formerly produced by the removal of the large masses to a position of no deviation in the position of the suspended masses.

This determination of the deviation, due to the large masses, was obtained before electrification of the mass was begun. They were, however, then above the surface of the earth, and subject to the inductive action of the atmosphere.

The results described in this paper indicate that the disturbances here discussed would be greatest if the work were done on a barren island, in a building above the level of the surrounding water. It is under such conditions that the phenomenon known as St. Elmo's fire is commonly observed. On land each blade of grass and the leaves of trees have a function similar to that of the masts of ships provided with lightning protection. They are individually less effective, but they are far more numerous.

In order to eliminate these disturbing effects the work should be done in a room below the surface of the earth the walls, ceiling and floor being of metal. Insulate copper wires within copper tubes should be connected with the masses. Those connected with the suspended masses should terminate in a cup of mercury. A flexible chain of metal attached to the middle of the bar carrying the suspended masses, should be provided at its lower end with a fine platinum wire, making contact with the mercury surface. These protected copper wires should be grounded in a well of water. The water in this well must be protected from any inductive action of the atmosphere.

Martin L. PERL The Gravitics Situation

The Gravitics Situation

(December 1956)

by

Martin L. Perl
Gravity Rand Ltd., 66 Sloane Street, London S.W. 1

Theme of the science for 1956-1970: Serendipity

Einstein's view: "It may not be an unattainable hope that some day a clearer knowledge of the processes of gravitation may be reached; and the extreme generality and detachment of the relativity theory may be illuminated by the particular study of a precise mechanism".

Contents ~

I. Engineering Note on Present Frontiers of Knowledge
II. Management Note on the Gravitics Situation
III. Glossary
IV. References
Appendix I: Summary of Townsend Brown's Original Specification for an Apparatus for Producing Force or Motion
Appendix II: Mozer's Quantum Mechanical Approach to the Existence of Negative Mass & its Utilization in the Construction of Gravitationally Neutralized Bodies
Appendix III: Gravity Effects (Beam's)
Appendix IV: A Link Between Gravitation & Nuclear Energy (Deser and Arnowitt)
Appendix V: Gravity/Heat Interaction (Wickenden)
Appendix VI: Weight-Mass Anomaly (Perl)

Thanks to the Gravity Research Foundation for Appendix II - VI

I. Engineering Note on present frontiers of knowledge ~

Gravitics is likely to follow a number of separate lines of development: the best known short term proposition is Townsend Brown's electrostatic propulsion by gravitators (details of which are to be found in the Appendix I). An extreme extrapolation of Brown's later rigs appears to suggest a Mach 3 interceptor type aircraft. Brown called this basically force and motion, but it does not appear to be the road to a gravitational shield or reflector. His is the brute force approach of concentrating high electrostatic charges along the leading edge of the periphery of a disk which yields propulsive effect. Brown originally maintained that his gravitators operate independently of all frames of reference and it is motion in the absolute sense - relative to the universe as a whole. There is however no evidence to support this. In the absence of any such evidence, it is perhaps more convenient to think of Brown's disks as electrostatic propulsion which has its own niche in aviation. Electrostatic disks can provide lift without speed over a flat surface. This could be an important advance over all forms of airfoil which require induced flow; and lift without air flow is a development that deserves to be followed up in its own right, and one that for military purposes is already envisaged by the users as applicable to all three services. This point has been appreciated in the United States and a program in hand may now ensure that development of large sized disks will be continued. This is backed by the US Government, but it is something that will be pursued on a small scale. This acceptance follows Brown's original suggestion embodied in Project Winterhaven. Winterhaven recommended that a major effort be

concentrated on electrogravitics based on the principle of his disks. The U.S. Government evaluated the disks wrongly, and misinterpreted the nature of the energy. This incorrect report was filed as an official assessment, and it took some three years to correct the earlier misconception. That brings developments up to the fairly recent past, and by that time it was realized that no effort on the lines of Winterhaven was practical, and that more modest aims should be substituted. These were re-written around a new report which is apparently based on newer thoughts and with some later patents not yet published which form the basis of current U.S. policy. It is a matter of some controversy whether this research could be accelerated by more money but the impression in Gravity Rand is that the base of industry is perhaps more than adequately wide. Already companies are specializing in evolution of particular components of an electrogravitics disk. This implies that the science is in the same state as the ICBM - namely that no new breakthroughs are needed, only intensive development engineering. This may be an optimistic reading of the situation: it is true that materials are now available for the condensers giving higher k figures than were postulated in Winterhaven as necessary, and all the ingredients necessary for the disks appear to be available. But industry is still some way from having an adequate power sources and possessing any practical experience of running such equipment.

The long term development of gravity shields, absorbers, and 'magic metals' appears at the moment however to be a basically different problem, and work on this is not being sponsored, so far as is known. The absorber or shield could be intrinsically a weapon of a great power, the limits of which are difficult to foresee. The power of the device to undermine the electrostatic forces holding the atom together is a destructive by-product of military significance. In unpublished work Gravity Rand has indicated the possible effect of such a device for demolition. The likelihood of such work being sponsored in small countries outside the U.S. is slight, since there is general lack of money and resources and in all such countries quick returns are essential.

Many people hold that little or no progress can be made until the link in the Einstein unified field theory has been found. This is surely a somewhat defeatist view, because although no all embracing explanation of the relationship between the extraordinary variety of high energy particles continually being uncovered is yet available much can be done to pin down the general nature of anti-gravity devices.

There are several promising approaches one of them is the search for negative mass, a second is to find a relationship between gravity and heat, and a third is to find the link between gravitation and the coupled particles. Taking the first of these: negative mass, the initial task is to prove the existence of negative mass, and Appendix II outlines how it might be done. This is Mozer's approach, which is based on the Schroedinger time independent equation with the center of mass motion removed. As the paper shows, this requires some 100 bev - which is beyond the power of existing particle accelerators: however the present Russian and American nuclear programs envisage 50 bev bevatrons within a few years and at the present rate of progress in the nuclear sciences it seems possible that the existence of negamass will be proved by this method of a Bragg analysis of the crystal structure - or disproved.

If negamass is established, the precise part played by the subnuclear particles could be quickly determined. Working theories have been built up to explain how negative masses would be repelled by positive masses and pairs would accelerate gaining kinetic energy until they reach the speed of light and then assume the role of the high energy particles. It has been suggested by Ferrell that this might explain the role of neutrino, but this seems unlikely without some

explanation of the spin ascribed to the neutrino. Yet the absence of rest mass or charge of the neutrino makes it especially intriguing. Certainly, further study of the neutrino would be relevant to gravitational problems. If, therefore, the aircraft industry regards anti-gravity as part of its responsibilities it cannot escape the necessity of monitoring high energy physics or the neutrino. There are two aircraft companies definitely doing this; but little or no evidence that most of the others know even what a neutrino is.

The relationship between electrical charges and gravitational forces however will depend on the right deductions being drawn from excessively small anomalies (*App. VI). First clues to such small and hitherto unnoticed effects will come by study of the unified field theory. Such effects may be observed in work on the gravithermals, and interacting effect of heat and gravity. Here, at least, there is firmer evidence materials are capable of temperature changes depending on gravity. This, as Beams says, (see Appendix III) is due to results from the alignment of the atoms. Gravity tensions applied across the ends of a tube filled with electrolyte can produce heat or be used to furnish power. The logical extension of this is an absorber of gravity in the form of a flat plate and the gravitative flux acting on it (its atomic and molecular structure, its weight density and form are not, at this stage, clear) would lead to an increase in heat of the mass of its surface and subsurface particles.

The third approach is to aim at discovering a connection between nuclear particles and the gravitational field. This also returns to the need for interpreting macroscopic relativistic phenomena at one extreme in terms of microscopic quantum mechanical phenomena at the other. Beaumont in suggesting a solution recalls how early theory established rough and ready assumptions of the characteristics of electron spin before the whole science of the atomic orbital was worked out. These were based on observation and they were used with some effect at a time when data was needed. Similar assumptions of complex spin might be used to link the microscopic to the macroscopic. At any rate, there are some loose ends in complex spin to be tied up, and these could logically he sponsored with some expectation of results by companies wondering how to make a contribution.

If a real spin or rotation is applied to a planar geoid the gravitational equipotentials can be made less convex, plane or concave. These have the effect of adjusting the intensity of the gravitational field at will which is a requirement for the gravity absorber. Beaumont seemed doubtful whether external power would have to be applied to achieve this. but it seems reasonable to suppose that power could be fed into the system to achieve a beneficial adjustment to the gravitational field, and conventional engineering methods could ensure that the weight of power input services would be more than offset by weightlessness from the spin inducer. The engineering details of this are naturally still in the realms of conjecture; but, at least, it is something that could be worked out with laboratory rigs; and, again, the starting point is to make more accurate observations of small effects. The technique would be to accept any anomalies in nature and from them to establish what would be needed to induce a spin artificially.

It has been argued that the scientific community faces a seemingly impossible task in attempting to alter gravity when the force is set up by a body as large as this planet and that to change it might demand a comparable force of similar planetary dimensions. It was scarcely surprising therefore that experience had shown that while it has been possible to observe the effects of gravity it resisted any form of control or manipulation. But the time is fast approaching when for the first time it will be within the capability of engineers with bevatrons to work directly with

particles that it, is increasingly accepted, contribute to the source of gravitation; and whilst that in itself may not lead to an absorber of gravity, it will at least throw some light on the sources of the power.
Another task is solution (* See Appendix IV) of outstanding equations to convert gravitational phenomena to nuclear energy. The problem, still not yet solved may support the Bondi-Hoyle theory that expansion of the universe represents energy continually annihilated instead of being carried to the boundaries of the universe. This energy loss manifests itself in the behavior of the hyperon and K-particles which would, or might, form the link between the microcosm and macrocosm. Indeed Deser and Arnowitt propose that the new particles are a direct link between gravitationally produced energy and nuclear energy.

If this were so it would be the place to begin in the search for practical methods of gravity manipulation. It would be realistic to assume that the K-particles are such a link. Then a possible approach might be to disregard objections which cannot be explained at this juncture until further unified field links are established. As in the case of the spin and orbital theories, which were naive in the beginning, the technique might have to accept the apparent forces and make theory fit observation until more is known.

Some people feel that the chances of finding such a unified field theory to link gravity and electrodynamics are high; yet think that the finding of a gravity shield is slight because of the size of the energy source, and because the chances of seeing unnoticed effects seem slender. Others feel the opposite and believe that a link between nuclear energy and gravitational energy may precede the link between the Einstein general relativistic and Quantum Theory disciplines. Some hope that both discoveries may come together; while a few believe that a partial explanation of both may come about the same time, which will afford sufficient knowledge of gravitational fields to perfect an interim type of absorber using field links that are available.

This latter seems the more likely since it is already beginning to happen. There is not likely to be any sudden full explanation of the microcosm and macrocosm; but one strand after another joining them will be fashioned, as progress is made towards quantizing the Einstein theory.

II. Management Note on the Gravitics Situation ~

The present anti-gravity situation as one of watching and waiting by the large aircraft prime contractors for lofting inventions or technological breakthroughs. Clarence Birdseye in one of his last utterances thought that an insulator might be discovered by accident by someone working on a quite different problem; and in 500 years gravity insulators would be commonplace. One might go further than Birdseye and say that principles of the insulator would, by then, be fundamental to human affairs; it would be as basic to the society as the difference today between the weight of one metal and another. But at the same time it would be wrong to infer from Birdseye's remark that a sudden isolated discovery will be the key to the science. The hardware will come at a time when the industry is ready and waiting for it. It will arrive after a long period of getting accustomed to thinking in terms of weightlessness, and naturally it will appear after the feasibility of achieving it in one form or another has been established in theory. (* But this does not mean that harnessed forces will be necessarily fully understood at the outset.)

The aim of companies at this stage must therefore surely be to monitor the areas of progress in

the world of high energy physics which seem likely to lead to establishment of the foundations of anti-gravity. This means keeping a watchful eye on electrogravitics, magnetogravitics, gravitics isotopes; and electrostatics in various forms for propulsion or levitation.

This is not at the present stage a very expensive business, and investment in laboratory man-hours is necessary only when a certain line of reasoning which may look promising comes to a dead-end for lack of experimental data, or only when it might be worth running some laboratory tests to bridge a chasm between one part of a theory and another or in connecting two or more theories together. If this is right, anti-gravity is in a state similar to nuclear propulsion after the NEPA findings, yet before the ANP project got under way. It will be remembered that was the period when the Atomic Energy Commission sponsored odd things here and there that needed doing. But it would be misleading to imply that hardware progress on electrostatic disks is presently so far along as nuclear propulsion was in that state represented by ANP. True the NEPA men came to the conclusion that a nuclear-propelled aircraft of a kind could be built, but it would be only a curiosity. Even at the time of the Lexington and Whitman reports it was still some way from fruition: the aircraft would have been more than a curiosity but not competitive enough to be seriously considered.

It is not in doubt that work on anti-gravity is in the realm of the longer term future. One of the tests of virility of an industry is the extent to which it is so self confident of its position that it can afford to sponsor R&D which cannot promise a quick return. A closing of minds to anything except lines of development that will provide a quick return is a sign of either a strait-laced economy or of a pure lack of prescience, (or both).

Another consideration that will play its part in managerial decision is that major turning points in anti-gravity work are likely to prove far removed from the tools of the aircraft engineer. A key instrument for example that may determine the existence of negamass and establish posimass-negamass interaction is the super bevatron. It needs some 100 bev gammas on hydrogen to perform a Bragg analysis of the elementary particle structure by selective reflection to prove the existence of negamass. This value is double as much the new Russian bevatron under construction and it is 15 times as powerful as the highest particle accelerations in the Berkeley bevatron so far attained. Many people think that nothing much can be done until negamass has been observed. If industry were to adopt this approach it would have a long wait and a quick answer at the end. But the negamass-posimass theory can be further developed; and, in anticipation of its existence, means of using it in a gravitationally neutralized body could be worked out. This, moreover, is certainly not the only possible approach: a breakthrough may well come in the interaction between gravitative action and heat theory at the moment suggests that if gravity could produce heat the effect is limited at the moment to a narrow range (* See Appendix V). But the significant thing would be establishment of a principle.

History may repeat itself thirty years ago, and even as recently as the German attempts to produce nuclear energy in the war, nobody would have guessed that power would be unlocked by an accident at the high end of the atomic table. All prophecies of atomic energy were concerned with how quickly means of fusion could be applied at the low end. In anti-gravity work, and this goes back to Birdseye, it may be an unrelated accident that will be the means of getting into the gravitational age. It is a prime responsibility of management to be aware of possible ways of using theory to accelerate such a process. In other words, serendipity.

It is a common thought in industry to look upon the nuclear experience as a precedent for gravity, and to argue that gravitics will similarly depend on the use of giant tools, beyond the capabilities of the air industry and that companies will edge into the gravitational age on the coat-tails of the Government as industry has done, or is doing, in nuclear physics. But this over looks the point that the two sciences are likely to be different in their investment. It will not need a place like Hanford or Savannah River to produce a gravity shield or insulator once the knowhow has been established. As a piece of conceptual engineering the project is probably likely to be much more like a repetition of the turbine engine. It will be simple in its essence, but the detailed componentry will become progressively more complex to interpret in the form of a stable flying platform and even more intricate when it comes to applying the underlying principles to a flexibility of operating altitude ranging from low present flight speeds at one extreme to flight in a vacuum at the other. This latter will be the extreme test of its powers. Again the principle itself will function equally in a vacuum - Townsend Brown's saucers could move in a vacuum readily enough - but the supporting parts must also work in a vacuum. In practice, they tend to give trouble, just as gas turbine bits and pieces start giving trouble in proportion to the altitude gained in flight.

But one has to see this rise in complexity with performance and with altitude attainment in perspective: eventually the most advanced capability may be attained with the most extremely simple configurations. As is usual however in physics developments the shortest line of progress is a geodesic, which may in turn lead the propulsion trade into many roundabout paths as being the shortest distance between aims and achievement.

But aviation business is understandably interested in knowing precisely how to recognize early discoveries of significance and this Gravity Rand report is intended to try and outline some of the more promising lines. One suggestion frequently made is that propulsion and levitation may be only the last - though most important - of a series of others, some of which will have varying degrees of gravitic element in their constitution. It may be that the first practical application will be in the greater freedom of communications offered by the change in wave technique that it implies. A second application is to use the wave technique for anti-submarine detection, either airborne or seaborne. This would combine the width of horizon in search radar with the underwater precision of Magnetic Airborne Detection, and indeed it may have the range of scatter transmissions. Chance discoveries in the development of this equipment may lead to the formulation of new laws which would define the relationship of gravity in terms of usable propulsion symbols. Exactly how this would happen nobody yet knows and what industry and government can do at this stage is to explore all the possible applications simultaneously, putting pressure where results seem to warrant it.

In a paper of this kind it is not easy to discuss the details of the wave technique in communications, and the following are some of theories, briefly stated which require no mathematical training to understand, which it would be worth management keeping an eye on. In particular, watch should be made of quantitative tests on lofting, and beneficiation of material.

Even quite small beneficiation ratios are likely to be significant. There are some lofting claims being made of 20% and more, and the validity of these will have to be weighed carefully. Needless to say much higher ratios than this will have to be attained. New high-k techniques and extreme-k materials are significant. High speeds in electrostatic propulsion of small discs will be worth keeping track of (by high speed one means hundreds of mph) and some of these results are

beginning to filter through for general evaluation. Weight mass anomalies, new oil-cooled cables, interesting megavolt gimmicks, novel forms of electrostatic augmentation with, hydrocarbon and non-hydrocarbon fuels are indicative, new patents under the broadest headings of force and motion may have value, new electrostatic generator inventions could tip the scales and unusual ways of turning condensers inside-out, new angular propulsion ideas for barycentric control; and generally certain types of saucer configuration are valuable pointers to ways minds are working.

Then there is the personnel reaction to such developments. Managements are in the hands of their technical men, and they should beware of technical teams who are dogmatic at this state. To assert electrogravitics is nonsense; is as unreal as to say it is practically extant. Management should be careful of men in their employ with a closed mind - or even partially closed mind - on the subject.

This is a dangerous age: when not only is anything possible, but it is possible quickly. A wise Frenchman once said you have only to live long enough to see everything 'and the reverse of everything;' and that is true in dealing with very advanced high energy physics of this kind.

Scientists are not politicians: they can reverse themselves once with acclaim - twice even with impunity. They may have to do so in the long road to attainment of this virtually perfect air vehicle. It is so easy to get bogged down with problems of the present; and whilst policy has to be made essentially with the present in mind - and in aviation a conservative policy always pays - it is management's task and duty to itself to look as far ahead as the best of its technicians in assessing the posture of the industry.

Glossary ~

Gravithermals: alloys which may be heated or cooled by gravity waves (Lover's definition).

Thermisters: materials capable of being influenced by gravity.

Electrads: materials capable of being influenced by gravity.

Gravitator: a plurality of cell units connected in series: negative and positive electrodes with an interposed insulating member (Townsend Brown's definition).

Lofting: the action of levitation where gravity's force is more than overcome by electrostatic or other propulsion.

Beneficiation: the treatment of an alloy or substance to leave it with an improved mass-weight ratio.

Counterbary: this, apparently, is another name for lofting.

Barycentric control: the environment for regulation of lofting processes in a vehicle.

Modulation: the contribution to lofting conferred on a vehicle by, treatment of the substance of

its construction as distinct from that added to it by outside forces. Lofting is a synthesis of intrinsic and extrinsic agencies.

Absorber; insulator: these terms - there is no formal distinction between them as yet - are based on an analogy with electromagnetism. This is a questionable assumption since the similarity between electromagnetic and gravitational fields is valid only in some respects such as both having electric and magnetic elements. But the difference in coupling strengths, noted by many experimenters, is fundamental to the science. Gravity moreover may turn out to be the only non-quantized field in nature, which would make it, basically, unique. The borrowing of terms from the field of electromagnetism is therefore only a temporary convenience. Lack of Cartesian representation makes this a baffling science for many people.

Negamass: proposed mass that inherently has a negative charge.

Posimass: mass, the observed quantity - positively charged.

Shield: a device which not only opposes gravity (such as an absorber) but also furnishes an essential path along which or through which, gravity can act. Thus whereas absorbers reflectors and insulators can provide a gravitationally neutralized body, a shield would enable a vehicle or sphere to 'fall away' in proportion to the quantity of shielding material.

Screening: gravity screening was implied by Lanczos. It is the result of any combination of electric or magnetic fields in which one or both elements are not subject to varying permeability in matter.

Reflector: a device consisting of material capable of generating buoyant forces which balance the force of attraction. The denser the material, the greater the buoyancy force. When the density of the material equals the density of the medium the result will be gravitationally neutralized. A greater density of material assumes a lofting role.

Electrogravitics: the application of modulating influences in an electrostatic propulsion system.

Magnetogravitics: the influence of electromagnetic and meson fields in a reflector.

Bosun fields: these are defined as gravitational electromagnetic, ¼ and r meson fields (Metric tensor).

Fermion fields: these are electrons, neutrinos, muons, nucleons, and V-particles (Spinors).

Gravitator cellular body: two or more gravitator cells connected in series within a body (Townsend Brown's definition)

References ~

Mackenzie: *Physical Review* 2: 321-343.
Eotvos, Pekar & Fekete: *Annalen der Physik* 68: 11-16(1922)
Heyl, Paul R.: *Scientific Monthly* 47: 115 (1938)

Austin, Thwing: *Physical Review* 5: 494-500 (1897)
Shaw: *Nature* (April 8,1922), p. 462; *Proc. Roy. Soc*. 102: 46 (Oct. 6, 1922)
Brush: *Physical Review* 31 (A): 1113
Wold: *Physical Review* 35: 296.
Majorana: *Attidella Reale Academie die Lincei* 28: 160, 221, 313, 416, 480 (1919); ibid., 29: 23, 90, 163, 235 (1920); Phil. Mag. 39: 288 (1920)
Schneiderov: *Science* (May 7, 1943), 97 suppl. p. 10.
Brush: *Physical Review* 32: 633
Lanczos: *Science* 74 (Dec 4, 1931), suppl. p. 10.
Eddington: *Report on the Relativity Theory of Gravitation* (1920), Fleetway Press, London.
W.D. Fowler, et all.: *Phys, Rev.* 93: 861 (1954).
R.L. Arnowitt & S. Deser: *Phys. Rev.* 92: 1061 (1953)
R. L. Arnowitt: *Bull. Amer. Phys. Soc.* 94: 798 (1954)
S. Deser: *Phys. Rev.* 93: 612 (1954)
N. Schein, D.M. Haskin & R.G. Glasser: *Phys. Rev.* 95: 855 (1954)
R.L. Arnowitt & S. Deser: unpublished, Univ. of California Radiation Laboratory Report (1954)
H. Bondi & T. Gold: *Mon. Not. Roy. Astr. Soc.* 108: 252 (1948)
F. Hoyle: *Mon. Not. Roy. Astr. Soc*. 108: 372 (1948)
B.S. DeWitt: *New Directions for Research in the Theory of Gravitation*; Essay on Gravity (1953)

C. H. Bondi: *Cosmology*, Cambridge University Press (1952)
F.A.E. Pirani & A. Schild: *Physical Review* 79: 986 (1950)
Bergman, et al: *Physical Review* 80: 81 (1950)
B.S. DeWitt: *Physical Review* 85: 653 (1952)
See, for example, D. Bohm: *Quantum Theory*; New York, Prentice-Hall, Inc. (1951) Chapter 22.
B.S. DeWitt: *Physical Review* 90: 357 (1953), and thesis (Harvard, 1950).
A. Pais: *Proceedings of the Lorentz Kamerlingh Onnes Conference*, Leyden, (June 1953)
For the treatment of spinors in a unified field theory see W. Pauli: *Annalen der Physik* 18: 337 (1933). See also B.S. DeWitt & C.M. DeWitt: *Physical Review* 87: 116 (1952)
F.L. Carter: *The Quantum Mechanical Electromagnetic Approach to Gravity*; Essays on Gravity (1953)
Prof. J.M. Luttinger: *On Negative Mass in the Theory of Gravitation*; Essays on Gravity (1953).

Appendix I: Summary of Townsend Brown's Original Patent Specification, "A Method of and an Apparatus or Machine for Producing Force or Motion" ~

This invention relates to a method of controlling gravitation and for deriving power therefrom, and to a method of producing linear force or motion. The method is fundamentally electrical. The invention also relates to machines or apparatus requiring electrical energy - that control or influence the gravitational field or the energy of gravitation; also to machines or apparatus requiring electrical energy that exhibit a linear force or motion which is believed to be independent of all frames of reference save that which is at rest relative to the universe taken as a whole, and said linear force or motion is furthermore believed to have no equal and opposite reaction that can be observed by any method commonly known and accepted by the physical science to date.
Such a machine has two major parts A and B. These parts may be composed of any material capable of being charged electrically. Mass A and mass B may be termed electrodes A and B

respectively. Electrode A is charged negatively with respect to electrode B, or what is substantially the same, electrode B is charged positively with respect to electrode A, or what isusually the case, electrode A has an excess of electrons while electrode B has an excess of protons.

While charged in this manner the total force of A toward B is the sum of force g (due to the normal gravitational field), and force e (due to the imposed electrical field) and force x (due to the resultant of the unbalanced gravitational forces caused by the electro-negative charge or by the presence of an excess of electrons of electrode A and by the electro-positive charge or by the presence of an excess of protons on electrode B).

By the cancellation of similar and opposing forces and by the addition of similar and allied forces the two electrodes taken collectively possess a force 2x in the direction of B. This force 2x, shared by both electrodes, exists as a tendency of these electrodes to move or accelerate in the direction of the force, that is, A toward B and B away from A. Moreover any machine or apparatus possessing electrodes A and B will exhibit such a lateral acceleration or motion if free to move.

In this Specification I have used terms as 'gravitator cells' and 'gravitator cellular body' which are words of my own coining in making reference to the particular type of cell I employ in the present invention. Wherever the construction involves the use of a pair of electrodes, separated by an insulating plate or member, such construction complies with the term gravitator cells, and when two or more gravitator cells are connected in series within a body, such will fall within the meaning of gravitator cellular body.

The electrodes A and B are shown as having placed between them an insulating plate or member C of suitable material, such that the minimum number of electrons or ions may successfully penetrate it. This constitutes a cellular gravitator consisting of one gravitator cell.

It will be understood that, the cells being spaced substantial distances apart, the separation of adjacent positive and negative elements of separate cells is greater than the separation of the positive and negative elements of any cell and the materials of which the cells are formed being the more readily affected by the phenomena underlying my invention than the mere space between adjacent cells, any forces existing between positive and negative elements of adjacent cells can never become of sufficient magnitude to neutralize or balance the force created by the respective cells adjoining said spaces. The uses to which such a motor, wheel or rotor may be put are practically limitless, as can be readily understood, without further description. The structure may suitably be called a gravitator motor of cellular type.

In keeping with the purpose of my invention an apparatus may employ the electrodes A and B within a vacuum tube. Electrons, ion, or thermions can migrate readily from A to B. The construction may be appropriately termed an electronic, ionic, or thermionic gravitator as the case may be.

In certain of the last named types of gravitator units it is desirable or necessary to heat to incandescence the whole or a part of electrode A to obtain better emission of negative thermions or electrons or at least to be able to control that emission by variation in the temperature of said electrode A. Since such variations also influence the magnitude of the longitudinal force or

acceleration exhibited by the tube, it proves to be a very convenient method of varying this effect and of electrically controlling the motion of the tube.

The electrode A may be heated to incandescence in any convenient way as by the ordinary methods utilizing electrical resistance or electrical induction.

Moreover, in certain types of the gravitator units, now being considered it is advantageous or necessary also to conduct away from the anode or positive electrode B excessive heat that may be generated during the operation. Such cooling is effected externally by means of air or water cooled flanges that are in thermo connection with the anode, or it is effected internally by passing a stream of water, air, or other fluid through a hollow anode made especially for that purpose.

The gravitator motors may be supplied with the necessary electrical energy for the operation and resultant motion thereof from sources outside and independent of the motor itself. In such instances they constitute external or independently excited motors. On the other hand, the motors when capable of creating sufficient power to generate by any method whatsoever all the electrical energy required therein for the operation of said motors are distinguished by being internal or self-excited. Here it will be understood that the energy created by the operation of the motor may at times be vastly in excess of the energy required to operate the motor. In some instances the ratio may be even as high as a million to one. Inasmuch as any suitable means for supplying the necessary electrical energy, and suitable conducting means for permitting the energy generated by the motor to exert the expected influence on the same may be readily supplied, it is now deemed necessary to illustrate details herein. In said self-excited motors the energy necessary to overcome the friction or other resistance in the physical structure of the apparatus, and even to accelerate the motors against such resistance, is believed to be derived solely from the gravitational field or the energy of gravitation. Furthermore, said acceleration in the self excited gravitator motor can be harnessed mechanically so as to produce usable energy or power, said usable energy or power, as aforesaid, being derived from or transferred by the apparatus solely from the energy of gravitation.

The gravitator motors function as a result of the mutual and unidirectional forces exerted by their charged electrodes. The direction of these forces and the resultant motion thereby produced are usually toward the positive electrode. This movement is practically linear. It is this primary action with which I deal.

As has already been pointed out herein, there are two ways in which this primary action can accomplish mechanical work. First, by operating in a linear path as it does naturally, or second, by operating in a curved path. Since the circle is the most easily applied of all the geometric figures, it follows that the rotary form is the important.

There are three general rules to follow in the construction of such motors.First, the insulating sheets should be as thin as possible and yet have a relatively high puncture voltage. It is advisable also to use paraffin saturated insulators on account of their high specific resistance. Second, the potential difference between any two metallic plates should be as high as possible and yet be safely under the minimum puncture voltage of the insulator. Third, there should in most cases be as many plates as possible in order that the saturation voltage of the system might be raised well above the highest voltage limit upon which the motor is operated.

Reference has previously been made to the fact that in the preferred embodiment of the invention herein disclosed the movement is towards the positive electrode. However, it will be clear that motion may be had in a reverse direction determined by what I have just termed 'saturation voltage' by which is meant the efficiency peak or maximum of action for that particular type of motor; the theory, as I may describe it, being that as the voltage is increased the force or action increases to a maximum which represents the greatest action in a negative to positive direction. If the voltage were increased beyond that maximum the action would decrease to zero and thence to the positive to negative direction.

The rotary motor comprises, broadly speaking, an assembly of a plurality of linear motors fastened to or bent around the circumference of a wheel. In that case the wheel limits the action of the linear motors to a circle, and the wheel rotates in the manner of a fireworks pin wheel.

I declare that what I claim is:

1. A method of producing force or motion, which comprises the step of aggregating the predominating gravitational lateral or linear forces of positive and negative charges which are so co-operatively related as to eliminate or practically eliminate the effect of the similar and opposing forces which said charges exert.

2. A method of producing force or motion, in which a mechanical or structural part is associated with at least two electrodes or the like, of which the adjacent electrodes or the like have charges of differing characteristics, the resultant, predominating, uni-directional gravitational force of said electrodes or the like being utilized to produce linear force or motion of said part.

3. A method according to Claim 1 or 2, in which the predominatin force of the charges or electrodes is due to the normal gravitational field and the imposed electrical field.

4. A method according to Claim 1, 2 or 3 in which the electrodes or other elements bearing the charges are mounted, preferably rigidly, on a body or support adapted to move or exert force in the general direction of alignment of the electrodes or other charge-bearing elements.

5. A machine or apparatus for producing force or motion, which includes at least two electrodes or like elements adapted to be differently charged, so relatively arranged that they produce a combined linear force or motion in the general direction of their alignment.

6. A machine according to Claim 5 in which the electrodes or like elements are mounted, preferably rigidly on a mechanical or structural part, whereby the predominating uni-directional force obtained from the electrodes or the like is adapted to move said part or to oppose forces tending to move it counter to the direction in which it would be moved by the action of the electrodes or the like.

7. A machine according to Claim 5 or 6 in which the energy necessary for charging the electrodes or the like is obtained either from the electrodes themselves or from an independent source.

8. A machine according to Claim 5, 6 or 7, whose force action or motive power depends in part on the gravitational field or energy of gravitation which is controlled or influenced by the action of the electrodes or the like.

9. A machine according to any of Claims 3 to 8, in the form of a motor including a gravitator cell or a gravitator cellular body, substantially as described.

10. A machine according to Claim 9, in which the gravitator, cellular body or an assembly of the gravitator cells is mounted on a wheel-like support, whereby rotation of the latter may be effected, said cells being of electronic, ionic or thermionic type.

11. A method of controlling or influencing the gravitational field or the energy of gravitation and for deriving energy or power therefrom comprising the use of at least two masses differently electrically charged, whereby the surrounding gravitational field is affected or distorted by the imposed electrical field surrounding said charged masses, resulting in a unidirectional force being exerted on the system of charged masses in the general direction of the alignment of the masses, which system when permitted to move in response to said force in the above mentioned direction derives and accumulates as the result of said movement usable energy or power from the energy of gravitation or the gravitational field which is so controlled, influenced, or distorted.

12. The method of and the machine or apparatus for producing force or motion by electrically controlling or influencing the gravitational field or energy of gravitation.

Appendix II: A Quantum Mechanical Approach to the Existence of Negative Mass and Its Utilization in the Construction of Gravitationally Neutralized Bodies ~

Since the overwhelming majority of electrostatic quantum mechanical effects rely for their existence on an interplay of attractive and repulsive forces arising from two types of charge, few if any fruitful results could come from a quantum mechanical investigation of gravity, unless there should be two types of mass. The first type, positive mass; (hereafter denoted a posimass) retains all the properties attributed to ordinary mass, while the second type, negative mass (hereafter denoted as negamass) differs only in that its mass is an inherently negative quantity.

By considering the quantum mechanical effects of the existence of these two types of mass, a fruitful theory of gravity will be developed. Theory will explain why negamass has never been observed, and will offer a theoretical foundation to experimental methods of detecting the existence of negamass and utilizing it in the production of gravitationally neutralized bodies. To achieve these results, recourse will be made to Schroedinger's time independent equation with the center of mass motion removed. This equation is:

$-h2/2\mu?2ß+Vß = Eß$

where all symbols represent the conventional quantum mechanical quantities. Particular attention will be paid to the reduced mass $\mu=(m1m2)/(m1+m2)$ where m1 and m2 are the masses of the two interacting bodies.

One can approach the first obstacle that any theory of negamass faces, namely the explanation of why negamass has never been observed, by a consideration of how material bodies would be formed if a region of empty space were suddenly filled with many posimass and negamass quanta. To proceed along these lines, one must first understand the nature of the various possible quantum mechanical interactions of posimass and negamass.

Inserting the conventional gravitational interaction potential into Schroedinger's equation and solving for the wave function ß, yields the result that the probability of two posimass quanta being close together is greater than the probability of their being separated. Hence, there is said to be an attraction between pairs of posimass quanta. By a similar calculation it can be shown that while the potential form is the same two negamass quanta repel each other. This arises from the fact that the reduced mass term in Schroedinger's equation is negative in this latter case. The type of negamass posimass interaction is found to depend on the relative sizes of the masses of the interacting posimass and negamass quanta, being repulsive if the mass of the negamass quantum is greater in absolute value than the mass of the posimass quantum, and attractive in the opposite case. If the two masses are equal in absolute value the reduced mass is infinite and Schroedinger's equation reduces to (V - E)ß - 0. Since the solution ß - 0 is uninteresting physically, it must be concluded that V - E, and, hence, there is no kinetic energy of relative motion. Thus, while there is an interaction potential between the equal mass posimass and negamass quanta, it results in no relative acceleration and thus, no mutual attraction or repulsion while much could be said about the philosophical implications of the contradiction between this result and Newton's Second Law, such discussion is out of the scope of the present paper, and the author shall, instead, return with the above series of derivations to a consideration of the construction of material bodies in a region suddenly filled with many posimass and negamass quanta.

Because of the nature of the posimass-posimass and negamass-negamass interactions, the individual posimass quanta soon combine into small posimass spheres, while nothing has, as yet, united any negamass quanta. Since it is reasonable to assume that a posimass sphere weighs more than a negamass quantum in absolute value, it will attract negamass quanta and begin to absorb them. This absorption continues until the attraction between a sphere and the free negamass quanta becomes zero due to the reduced mass becoming infinite. The reduced mass becomes infinite when the sphere absorbs enough negamass quanta to make the algebraic sum of the masses of its component posimass and negamass quanta equal to the negative of the mass of the next incoming negamass quantum. Thus the theory predicts that all material bodies after absorbing as many negamass quanta as they can hold, weigh the same very small amount, regardless of size.

Since this prediction is in violent disagreement with experimental fact, one must conclude that the equilibrium arising as a result of the reduced mass becoming infinite has not yet been reached. That is, assuming that negamass exists at all, there are not enough negamass quanta present in the universe to allow posimass spheres to absorb all the negamass they can hold. One is thus able to explain the experimental fact that negamass has never been observed by deriving the above mechanism in which the smaller amounts of negamass that may be present in the universe are strongly absorbed by the greater amounts of posimass producing bodies composed of both posimass and negamass, but which have a net positive, variable, total mass.

Having thus explained why negamass has never been observed in the pure state, it is next

desirable to derive an experimental test of the existence of negamass through considering the internal quantum mechanical problem of small amounts of negamass in larger posimass spheres. One is able to gain much physical insight into this problem by simplifying it to the qualitatively similar problem of one negamass quantum in the field of two posimass quanta that are fixed distance apart. Further simplification from three dimensions to one dimension and replacement of the posimass quanta potentials by square barriers, yields a solution in which the ground state energy E0 of the negamass quantum in the field of one posimass quantum, is split into two energy levels in the field of the two posimass quanta. These two levels correspond to even and odd parity solutions of the wave equation where Eeven lies higher and Eodd lower than E0. The magnitudes of the differences Eeven-E0 and E0-Eodd depend on the separation distance between the two posimass quanta, being zero for infinite separation and increasing as this separation distance is decreased.
Since the energy of a system involving negamass tends to a maximum in the most stable quantum mechanical configuration, the negamass quantum will normally be in state Eeven. When the system is excited into state Eodd, the negamass quantum will favor the situation in which the two posimass quanta are as far apart as possible, since Eodd increases with increasing separation distance between the two posimass quanta, and the system tends toward the highest energy state. Thus independent of and in addition to the attractive posimass posimass gravitational interaction, there is a repulsive quantum mechanical exchange interaction between pairs of posimass quanta when the system is in state Eodd. The result of these two oppositely directed interactions is that the two posimass quanta are in stable equilibrium at some separation distance.

Since this equilibrium occurs between all posimass pairs in an elementary particle, a necessary consequence of the existence of negamass is that when in the first excited state elementary particles have a partial crystal structure.

This theoretical conclusion is capable of experimental verification by performing a Bragg analysis of the elementary particle crystal structure through shining high energy gamma rays on hydrogen. Part of the gamma ray energy will be utilized in lowering the system from energy Eeven to Eodd, and if selective reflection is observed, it will constitute a striking verification of the existence of negamass. An order of magnitude calculation shows that, if the equilibrium distance between pairs of posimass quanta is one one-millionth the radius of an electron, 100 bev gamma rays will be required to perform this experiment.

Having discussed why negamass has never been observed, and having derived an experimental test of its existence it is next desirable to develop an experimental method of utilizing negamass in the production of gravitationally neutralized bodies by further consideration of some ideas previously advanced. It has been pointed out that if a source of negamass is present, aposimass sphere continues to absorb negamass quanta until equilibrium is reached as a result of the reduced mass becoming infinite. Because the sphere thus produced is practically massless and because the gravitational interaction between two bodies is proportional to the product of their respective masses, it follows that the sphere is practically unaffected by the presence of other bodies. And thus, the problem of making gravitationally neutralized bodies is reduced to the problem of procuring a source of negamass quanta. This will be the next problem discussed.

The binding energy of a negamass quantum in a posimass sphere may be obtained as one of the eigenvalue solutions to Schroedinger's Equation. If the negamass quanta in a body are excited to

energies in excess of this binding energy by shining sufficiently energetic gamma rays on the body these negamass quanta will be emitted and negamass source will thus be obtained.

To estimate the gamma ray energy required to free a negamass quantum from a posimass body, certain assumptions must be made concerning the size and mass of posimass and negamass quanta. Since these quantities are extremely indefinite, and since the whole theory is at best qualitative, attempting to estimate the energy would be a senseless procedure. Suffice it to say that because of the intimate, sub-elementary particle nature of the posimass-negamass interaction, it seems reasonable to assume that quite energetic gamma rays will be required to break this strong bond.

To briefly review what has been shown a quantum mechanical theory of negamass has been developed based on the assumptions that gravitational interactions obey the laws of quantum mechanics and that all possible interactions of negamass and posimass with themselves and each other follow the well known inverse square law. This theory explains the experimental fact that negamass has never been observed, and outlines plausible experimental methods of determining the existence of negamass and utilizing it in the construction of gravitationally neutralized bodies. While these experimental methods may perhaps be out of the realm of practicality at the present, there is every reason to hope that they will be performable in the future. At that time, the plausibility of the existence of negamass and the theory behind the construction of gravitationally neutralized bodies from it, will meet their final tests.

Summary Paragraph ~

A quantum mechanical theory of negative mass is developed, based on the assumptions that gravitational interactions obey the laws of quantum mechanics, and that all possible interactions of negative and positive mass with themselves and each other follow the well-known inverse square law. This theory explains the experimental fact that negative mass has never been observed, and outlines plausible experimental methods of determining the existence of negative mass and utilizing it in the construction of gravitationally neutralized bodies.

Prof. F. Mozer

Appendix III: Gravity Effects ~

The order of magnitude of the heat given off by an alloy as a result of the separation by gravity tension can be reliably estimated. Suppose we assume that an alloy of half tin and half lead completely fills a tube 5 meters long and 100 cm2 cross section which is maintained accurately at a temperature 277° C. At this temperature the alloy is liquid suppose next that the tube is raised from a horizontal plane into a vertical position, i.e. to a position where its length is parallel to the direction of gravity. If, then, the alloy is free from convection as it would be if it is maintained at uniform temperature and if it is held in this position for several months, the percentage of tin at the bottom of the tube will decrease while the relative amount at the top will increase. A simple calculation shows that the concentration of tin at the top is about one tenth of one percent greater than at the bottom and that approximately one calorie of heat is given off in the separation progress. If after several months the tube is again placed so that its length is in a horizontal plane the tin and lead will remix due to the thermal agitation of the atoms and heat is

absorbed by the alloy.

Another interesting effect occurs when an electrolyte is subjected to gravity tension. Suppose a five meter glass tube is filled with a water solution of say barium chloride and the electrical potential between its ends is measured first when the length of the tube is parallel to the horizontal and second when its length is vertical. The difference in potential between the two ends is practically zero when the tube i horizontal and approximately eighty five microvolts when it is vertical.

This effect was discovered by Des Coudres in 1892. If a resistor is attached across the ends when the tube is vertical, heat of course is produced. If the tube is maintained at constant temperature the voltage decreases with time and eventually vanishes. The effect is believed to result from the fact that the positively charged barium ions settle faster than the lighter negatively charged chlorine ions as a result of gravity tension.

In conclusion, we have seen that gravity tension effects an alloy in such a way that it gives off heat. This phenomenon results from the alignment of the atoms and from their separation by the gravitational field, the contribution of the latter being larger than that of the former. Also, the gravity tension sets up a potential across the ends of a tube filled with an electrolyte and this potential when applied across an external circuit may produce heat or drive an electric motor to furnish power. Several other small thermal effects possibly may arise from gravity tension in addition to those discussed above but space is not available to consider them in this essay. Also, studies of the effect of gravitational fields and their equivalent centrifugal fields upon matter will no doubt be of great value in the future.

J.W. Beams

Appendix IV: Link Between Gravitation & Nuclear Energy ~

by Dr Stanley Deser & Dr Richard Arnowitt

Quantitatively we propose the following field equations:

-kTuv = Ruv +.5Rguv + Cuv(ØŸ)

(.5‡u?ju + m + LPuvKuv(X))Ÿ = 0

with a similar equation for Ø. In the above, Ÿ represents the hyperon wave functions and Ø the K-particle quantized field operators. The first three terms in the first equation are the usual structures in the Einstein General Relativity. The last term, Cuv is the "creation" tensor which is to give us our conversion from gravitational to nuclear energy. It is like Tuv in being an energy momentum term. In the second equation ?ju represents the covariant derivative while ‡u is a generalized Dirac matrix arranged so that the second equation is indeed covariant under the general group of coordinate transformations. The PuvKuv term will automatically include the higher hyperon levels. Cuv is a functional of the hyperon and K-field variables Ÿ and Ø. As can be seen these equations are coupled in two ways first the creation term Cuv depends upon the field variables Ÿ and Ø while the gravitational metric tensor guv enters through the covariant

derivative, etc. L is a new universal constant giving the scale of the level spacings of the hyperons. Rigorously speaking the field equations should be, of course, second quantized. For purposes of obtaining a workable first approximation it is probably adequate to take expectation values and solve the semi-classical equations. The creation tensor Cuv must be a bilinear integral of the Ø and Ÿ fields and may have cross terms as well of the form †ØŸŸ(dx). These equations will indeed be difficult to solve; but upon solution will give the distribution of created energy and, hence, lead eventually to the more practical issues desired.

Appendix V: Gravity/Heat Interaction ~

Let us suppose that we have to investigate the question whether gravitative action alone upon some given substance or alloy can produce heat. We do not specify its texture, density nor atomic structure; we assume simply the flux of gravitative action followed by an increase of heat in the alloy.

If we assume a small circular surface on the alloy, then the gravitative flux on it may be expressed by Gauss' theorem and it is 4¼M,where M represents mass of all sub-surface particles; the question is, can this expression be transformed into heat. We will assume it can be. Now recalling the relativity law connecting mass and energy:

M = m0 + T/c2 (by Einstein)

where:- T = Kinetic energy

m = Initial mass

c = Velocity of Light

we set 4¼M = m0 +T/c2 = m0 + (m0v2)/2c2

But v2/c2 is a proper fraction: hence M = m0 + m0/2k

In the boundary case v=c, M=m0(1+1/k) for all other cases 4¼M=m0((k+1)/k)k k,0. Strictly M should be preceded by a conversion factor 1/k but if inserted, it does not alter results. Thus if gravity could produce heat, the effect is limited to a narrow range, as this result shows.

It merits stress that in a gravitational field the flow lines lines of descent -- are Geodesics.

J.W. Wickenden

Appendix VI: Weight-Mass Anomaly ~

There is a great need for a precise experimental determination of the weight to mass ratio of protons or electrons. Since the ratio for a proton plus an electron is known already, the determination of the ratio for either particle is sufficient. The difficulty of a direct determination of the gravitational deflection of a charged particle in an experiment similar to the neutron or

neutral atom experiment is due to electrical forces being much greater than gravitational forces. For example, one electron five meters away from a second electron exerts as much force on that second electron as the gravitational field does. Thus stray electrons or ions which are always present on the walls of an apparatus can exert sufficient force to completely mask the gravitational force. Even if the surface charges are neglected, image charges of the electron beam itself and self-repulsion in the beam may obscure the gravitational deflection. An additional problem is the Earth's magnetic field. Electrons of even a few volts energy will feel a force due to the Earth's field a thousand billion times larger than the gravitational deflection. This last problem is avoided in a static measurement of the ratio such as a weighing of ionized matter. However, this last method has the additional difficulty of requiring a high proportion of ionized to unionized matter in the sample being weighed. Of course all these problems can be resolved to some extent; but it is questionable if an experiment of either of the above types can be designed in which all the adverse effects can simultaneously be sufficiently minimized. Probably a completely new type of experiment will have to be devised to measure the weight to mass ratio of the proton or electron.
Such a measurement may detect a deviation from the law of constant weight to mass ratio. If such an anomaly can be shown to exist there is the possibility of finding a material which would be acted upon in an unusual manner in a gravitational field.

Martin L. Perl.

1. Ultimately, they go back to Einstein's general theory of relativity (1916), in which the law of gravitation was first mathematically formulated as a field theory (in contrast to Newton's "action-at-a-distance" concept).

George PIGGOTT Electro-Gravitation

Electrical Experimenter **(July 1920)**
(Reprinted in **Richard A. Ford:** ***Homemade Lightning -- Creative Experiments in Electricity***; McGraw-Hill; ISBN 0-07-137323-3)

Overcoming Gravitation

by

George Piggott

For some time past there has been quite a controversy going on regarding the subject of interplanetary communication by means of electric waves. I have been very much interested in the above on account of experiments which I have made and data collected pertaining to gravitation effects on high frequency oscillations and electronic discharges in general. A series of experiments which I conducted during the year 1904, caused me to formulate the theory that interplanetary transmission of electrical impulses was an impossibility on account of the sun’s resisting and absorbing influence which virtually isolates our planet from all other electrical vibrations of a lesser tension or power.

Gravitation Suspended in Experiments

The above theorem was arrived at after I had succeeded in sustaining a metallic object in space by means of a counter-gravitational effect produced through the action of an electric field upon the above object. A strong electric field was produced by means of a special form of generator and when the metallic object was held within its influence it drew up to approximately a distance of 1 mm from the center of the field, then was repelled backward toward an earthed contact, going within 10 cm of the same when it was again attracted toward the field's center but this time getting no nearer than 5 cm from the polar nucleus. This backward and forward movement contained for some time until the metallic object at last came to a comparatively stable position, about 25 cm from the field's center where it remained until the power was shut off. While the metallic object was suspended, I was able to study the effect of the surrounding field and found by means of a powerful microscope, assisted by the insertion of a vacuum tube within the field, that the metallic object (having of course a certain electrical capacity) became fully charged and gave off part of said charge to and against the surrounding field which tended to hold said object in space, apparently without any other sustaining influence. Around the outside of the metallic object and extending to a distance of about 1/2 cm was a completely dark belt or space in which there appeared to be no electrical agitation due, possibly, to neutralization caused by the contact of the large incoming energy supply from the field's center of with the small oscillating radiations from metallic object. The ever-changing action of attraction and repulsion resulted in the overcoming of gravitation. Going farther I will state that the dark belt above mentioned after many tests gave no sign of electrification, inasmuch as its width was but 1/2 cm. In fact, a dark line was shown in the vacuum tube when it was introduced between metallic object and center of field. It is my firm conviction that somewhere on the outer confines of our planet there exists a similar counteracting belt through which naught but the gravitational vibrations of the sun penetrate, and these vibrations absolutely annihilate or absorb all other less powerful ones.

Therefore, after making many experiments to ascertain as nearly as possible the absolute facts and conditions as they exist, I have come to the conclusion that all electrical disturbances not due to our own radio oscillations, on this globe are due to the sun's electrical activities in semi-inductional contact with our polar extremities.

Details of 'Defying Gravity'

The illustrations 1 to 4 will possibly give a fair idea of the apparatus used, and the manner in which the experiments were carried on.

Figure 1 shows the general scheme of arrangement of devices. In the lower left hand corner is shown the 'ground contact', which can be turned around and placed in any position found necessary; in fact, when a metallic object is in suspension, this ground can be entirely eliminated.

I have found that any substance within the limits of my experiments can he held in suspension, viz: water globules, metallic objects, and insulators being among those tried. Some materials such as cork and wood exhibit peculiar properties when suspended; a piece of green maple would not rest in one position in the field, but oscillated backward and forward, continuously, going to the field's center, then back to ground

Heated materials exhibited equally peculiar characteristics: A silver ball 11 mm in diameter when heated, remained farther away from the field's center than when at normal temperature; upon cooling it gradually drew up to the position it would occupy if unheated.

Figure 2 shows a generator of the Wimhurst type (improved), the generating or collecting units being entirely enclosed in an insulating case and operated under a pressure of 3 atmospheres;

completely dry air only, enters the case through the drying device attached to the air pump shown in Figure 1. Interior parts of the generator will retain quite a powerful charge for a long period of time.

Figure 3 illustrates suspension stand and field producing electrode. The latter can be revolved in any direction by means of a spring motor shown on the upper section of the stand.

The small apertures seen in electrode, which is hollow, are there for the purpose of ascertaining the action of the reduced field tension at these points, and are also made use of to hold different sized metallic discs, which are cemented to insulating plates, forming condensers, the function of which is to create weak opposite polarities at these points and thus show a reaction on the suspended object and also a greater ocular effect in the vacuum tube.

Figure 4 is a detailed drawing of the vacuum tube principally used; this is of the spectrum type, without sealed-in electrodes and when introduced into the electrical fields, flows very brightly at its extremities, especially giving a sharp line bordering the dark space around the metallic object. A very high vacuum is sustained in the tube and it is found necessary to build it of a very perfect insulating glass; the bulb must be kept absolutely dry on its outer surface.

Different tubes have been used beside the above; corrugated spherical, cone shaped, and cylindrical, with various results.

The electric field produced for suspension experiments is very powerful and intense, being detectable with a vacuum tube at a distance of over 6 meters (19.68 ft).

In conjunction with the above and drawing an analogy between the same, I am of the opinion that cometary motion is undoubtedly due to the activity of its compositional elements and their susceptibility t changes of polarity which, when the comet is far distant from the sun, would be opposite in sign to that of the latter, or when in close proximity to the ventral orb, would be of the same sign and therefore repelled.

All bodies in process of formation possibly have their cometary stage, and doubtless future experiments will reveal this fact.

Actual Effects Achieved by Mr Piggott

The total power required to operate the generator, which was run by an electric motor, was about 1/4 KW; the machine voltage was in the neighborhood of 500,000 when the electrodes were separated beyond sparking distance. The electrostatic charge left on the suspension electrode retained the average object in space for a short length of time, about 1-1/4 seconds after the machine ceased rotating.

Some objects such as copper and silver balls, which are of course good electrical conductors, and very nearly homogeneous, when falling toward the earth, after power had been shut off, seemed to slow down when they neared same, and hovered about 2 cm above contact for approximately 1 second of time before striking same; this was due no doubt to the inductional change in polarity which was imparted to balls almost at the instant of earth contact.

The aura, shown in Figure 3, near suspended balls (which in this experiment were made of silver) extended outward to a distance of about 1 cm and covered about one-half of the upper hemisphere and a trifle more of the lower hemisphere.

This bluish emanation appeared to be made up of numerous infinitesimal dots or darting particle, each apparently separated from the other by a very narrow, glowless belt. Wverything was, however, in a constant state of agitation and it was quite impossible to get an absolutely perfect

view microscopically, of an individual particle. Different substances have different auras both in length and breadth, and also in luminosity.

The silver balls used in these experiments had an actual gravitational weight of 1-3/10 gram (nearly 0.05 oz., avoirdupois) and were the heaviest objects suspended at this time, their diameter being 11 mm as before mentioned in another part of this article.

The largest object suspended was a cork cylinder 10 cm long by 4 cm diameter (approximately 4 by 1-9/16 inches) which had a copper wire pushed through its center, and extending beyond its ends to a distance of 3 mm. The weight of the above cylinder was 3/4 grams (0.002645 oz., avoirdupois).

The behavior of metal spheres used in the above experiments was a most interesting spectacle; silver and copper balls floated very steadily on one position and when suspending electrode was revolved, would follows and turn slightly axially, but would not revolve entirely around same, there being a peculiar slipping effect not entirely accounted for.

Figure 1 --- This picture shows Mr George Piggott, the author, and his laboratory with the powerful electrical apparatus used, whereby he was enabled to carry on successful experiments in nullifying the effects of gravitation. In other words, he was able to suspend small balls and other objects in the manner shown, the silver balls actually used having weighed 1.3 grams. The diameter of the balls was 11 mm.

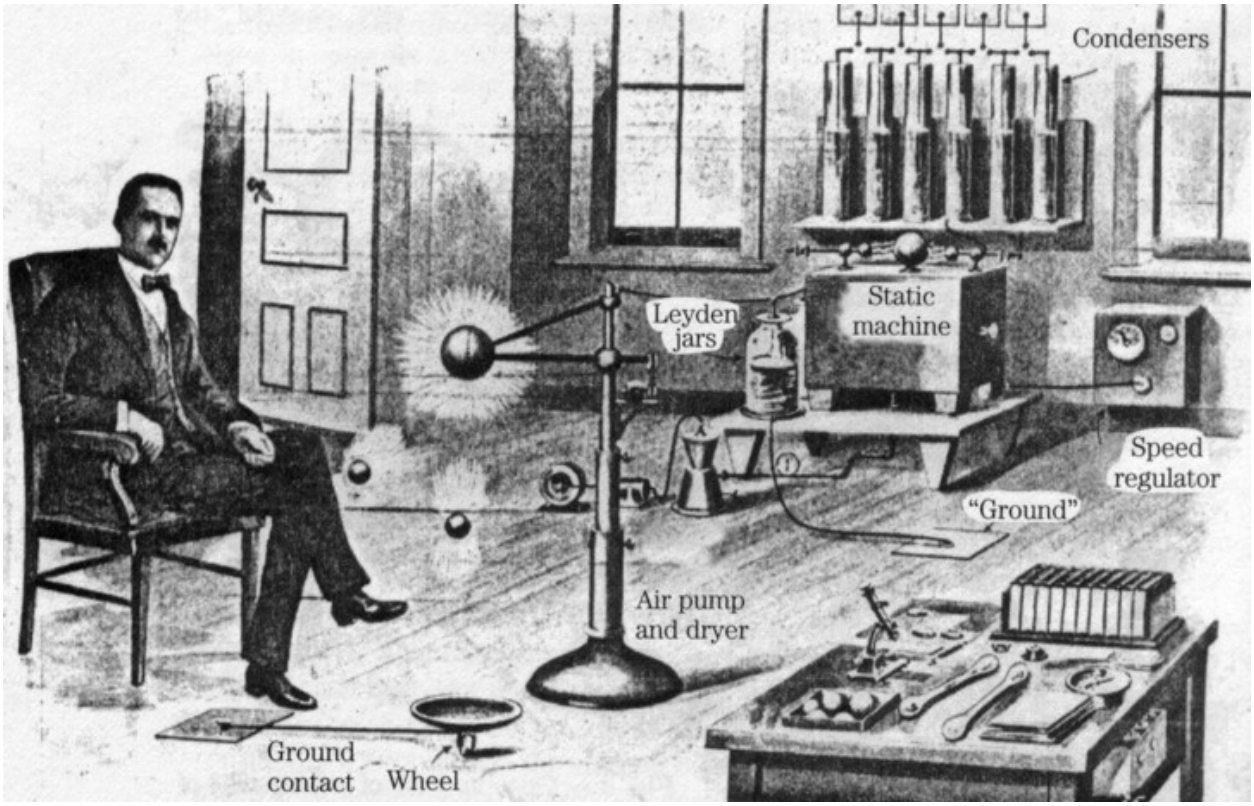


Figure 2 --- Special electrostatic machine used by Mr Piggott in his gravitation nullifying experiments, the which was enclosed in a heavy airtight compartment, so that it could be operated under several atmospheres of pressure.

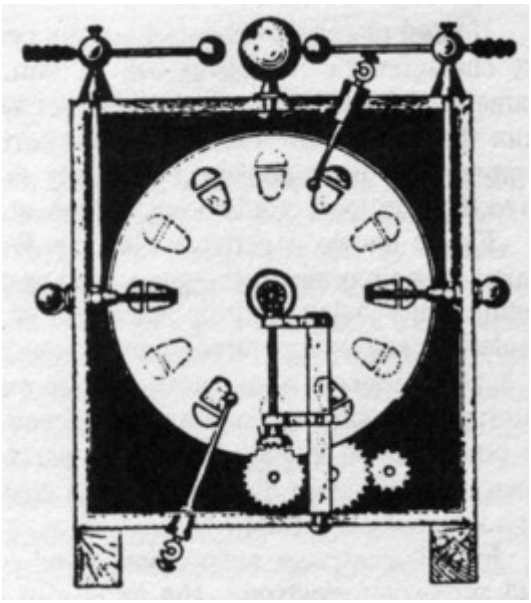


Figure 3 --- A close-up view of the charged metal sphere mounted on a pedestal together with a spring driving motor, whereby the electrode or charged ball could be rotated. The two smaller silver balls are shown as suspended in mid-air, the earth's gravitational pull having been nullified.

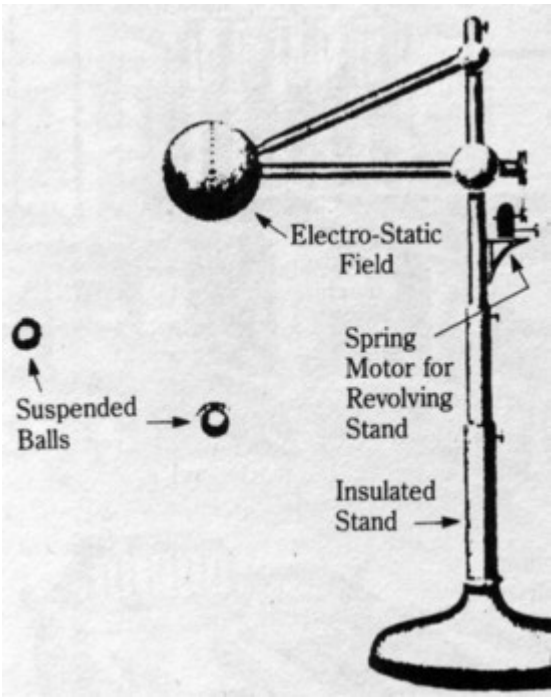
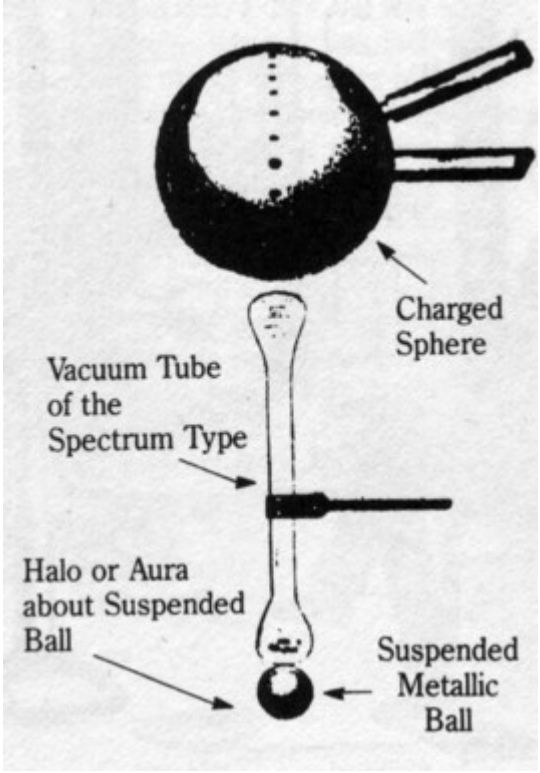


Figure 4 --- Close-up view of vacuum tube of the spectrum type used in studying the aura surrounding the suspended silver balls, while they remained suspended in space.



Jacques RAVATIN Activators

Jacques Ravatin was an associate of Leon Sprink. Ravatin invented smaller and more powerful versions of the Sprink Space Activator :

EP0016079 / WO 8000293

(Original, French, PDF)

APPARATUS FOR AMPLIFYING EMISSIONS DUE TO SHAPES

1980-10-01

Description --

The present invention refers to an equipment making it possible to amplify the emissions due to the forms, in particular with the single geometric forms presenting a minimum of symmetry.

It is known that certain geometric forms, for example pyramids, are, when they present appropriate proportions, the seat of emissions which one could not determine to present the exact nature. One noted that such emissions had effects, in particular on the living organisms.

Until present, it was not possible to obtain with the aforementioned emissions due to the forms, of the measurable and exploitable effects in industry.

The present invention has as an object an apparatus making it possible to amplify, according to a said principle of "localization", the emissions due to forms to obtain industrially exploitable effects.

According to the present invention, such an apparatus comprises essentially a geometric form presenting a minimum of symmetry in planar or space, this form being associated a device producing an electric and/or magnetic and/or electromagnetic field in determined volume by the aforementioned form or in the vicinity immediate of this volume, such fields being able to be fixed or movable compared to the aforementioned form, and being able to be modulated or not.

According to an embodiment prefered of the invention, the aforementioned form is a substantially regular polygonal frame with 16 dimensions and is associated a device producing an electric power in the volume delimited by the aforementioned frame, this device comprising four electrodes with dimensions regularly spaced on the aforesaid frame in their medium, two of the aforesaid electrodes having a stable, filtered continuous positive potential compared to the ground to which other electrodes are connected, the formed angle by the points of the **two positive electrodes** being, preferably, of approximately **28 degrees apart**, while that formed by the points of the two **negative electrodes is, preferably, of approximately 23 degrees**.

The aforementioned **positive potential is preferably of at least 45 kilovolts and preferably of at least 60 Kv**, the aforementioned electrodes having the general shape of points directed towards the center of the aforesaid frame, the points of the four said electrodes being, preferably, in a same plane, which is preferably, the planar mediator of the aforesaid polygonal frame, the square dummy one delimited by the of the aforesaid points four electrodes being concentric by report/ratio to that the frame and having **diagonal approximately 400 millimeters at least for a potential of approximately 45 Kv and approximately at least 1 metre for a potential of approximately 300 Kv**, **the diameter of the circle circumscribed with the formed polygon by the aforementioned frame being at least 200 centimetres for a potential of approximately 45 Kv, and at least 280 cm for a potential of approximately 300 Kv.**

According to an advantageous characteristic of the invention, the frame is made in a material, preferably out of a natural material, of which the structure, with the level of fibres or the crystalline level, is directed or has itself of remarkable symmetries. Preferably, each side of the **polygonal frame is constructed of a small, very dry solid wood plank,** the length of the small plank being taken preferably in the direction of fibres of the wood, the different successive small planks being connected between them by glue or using pegs, also made of wood, such pegs not having, preferably, to exceed small pieces.

Natural materials not having any coherent or directed structure, such as for example the rubber, are to be avoided.

According to an embodiment prefered of the invention, some of the small planks forming the with dimensions ones of the polygonal frame are with character of a **right Moebius strip**, and other with character of a **left Moebius strip**.

According to another embodiment of the invention, equipment comprises two or several regular polygonal concentric frames, each one having different numbers of dimensions.

To reinforce the effect of amplification, one can preferably have on the **stems supporting the electrodes the parts, preferably out of same material that that of the frame, having for example round ovoidal or rhomboidal**, and when several of these forms are laid out on the same stem of an electrode, dimensions of these parts are homothetic, **those having lowest dimensions being close to the corresponding electrode, the other parts being laid out after, and all the more far away from the first their dimensions are larger**.

To reinforce the effect of amplification, one can also lay out on certain sides of the form or in proximity volumes preferably manufactured of same material that the frame, these volumes being in general single geometric volumes, for example of the trunks of cylinders finishing with the one their ends by a conical point, the **angle of opening of these cones being preferably of approximately 140 degrees**.

One can also lay out in the form itself or near inorganic natural or synthetic, such as **carborundum**.

One can also **add systems with acoustic resonance** in appropriate places, in proximity to the frame.

The various additional forms can be made out of separate materials, or a single material so their edges can be joined.

The form can also manufactured using a control of appropriate form in which one makes fluid circulation fluid possible.

To further increase the effect of amplification of the device of the invention, one can fix it on a single or equatorial mounting and direct it in an appropriate way.

The present invention will be better understood using the detailed description of several taken embodiments like the nonrestrictive examples illustrated by the annexed drawings, in which

- **Figure 1** is a planar view of an embodiment prefered of an according device to the present invention;

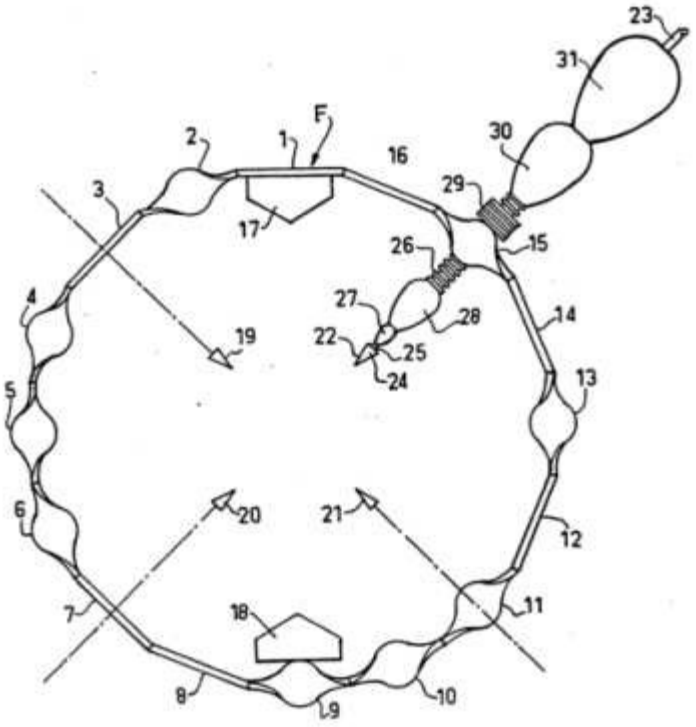


FIG.1

- **Figures 2 and 3** are cross-sections of two embodiments of electrodes of the devices of figures 1 and 2; and,

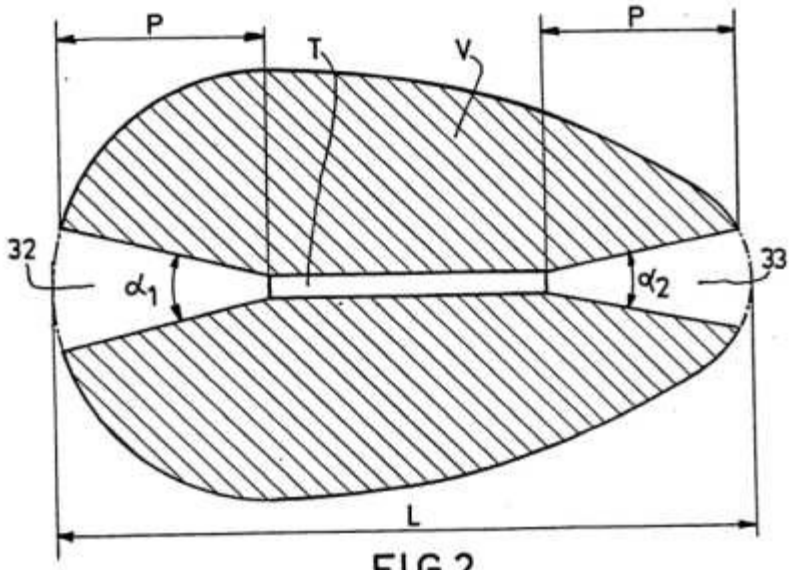


FIG.2

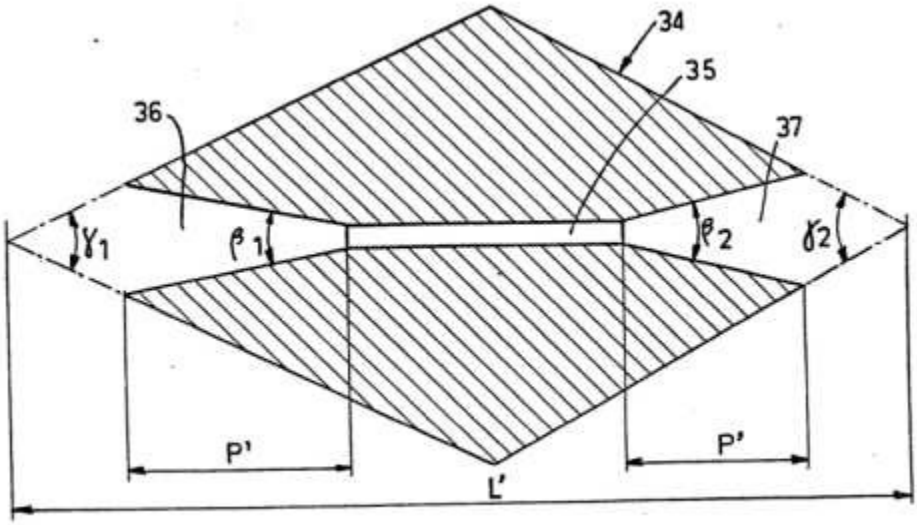


FIG.3

BUREAU
OMPI

- **Figure 4** is a schematic view of an alternative of the device of Figure 1.

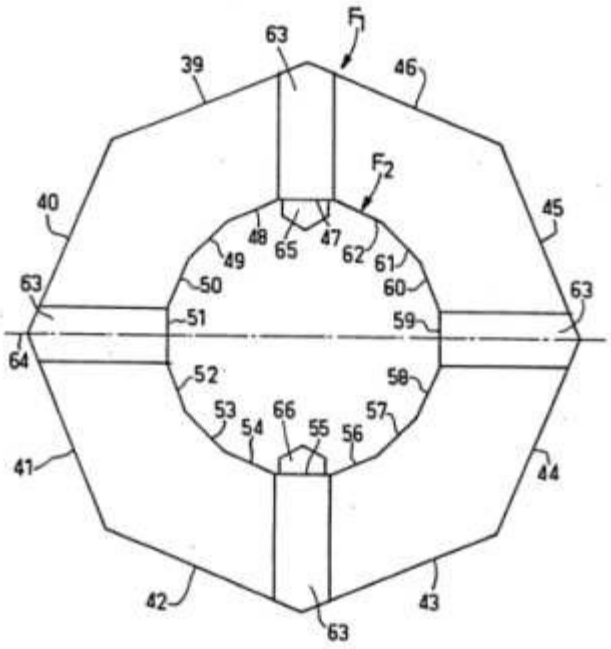


FIG. 4

The apparatus of amplification represented on Figure 1 includes essentially a geometric form F and four electrodes with their stem electrode holders affixed to create an electric field in the volume delimited by the aforementioned form, and in the vicinity.

In the case of the embodiment prefered of the invention represented on Figure 1, the present form F like an hollow cylinder lof shallow depth, the wall of this cylinder, or frame, having out of radial cut substantially the shape of a **regular polygon with 16 sides** with dimensions respectively referred 1 to 16.

However, it is clearly understood that the polygonal hollow cylindrical form is not the only one possible, other forms, for example pyramidal forms also can be used in the frame of the invention.

The sixteen sides of the frame materializing the form F can all be substantially identical, and consist each one of a rectangular parallelepiped. However, the applicant noted that if some of the dimensions are different, and in particular **if certain sides have a character of left strip of Moebius and other character of straight Moebius strip, one obtains good amplification of the emissions** due to the form F.

In the embodiment prefered of the invention represented in Figure I, with dimensions referred the 1, 3, 7, 8, 12,14 and consisted rectangular parallelepipeds, sides 2, 4, 5, 9; 11,13 and 15 consist of volumes with the character of a right Moebius strip and with dimensions the 6 and 10 are left Moebius strips. However, it is clearly understood that other different provisions on the formed sides by rectangular parallelepipeds, by volumes with characters of strip of left and right

Moebius can be considered while getting an improvement of amplification also of the aforesaid emissions. By volumes with character strip of Moebius one hears volumes resulting of the **twist of 180 degrees** of the one of the ends of a rectangular cuboid strip compared to the other end (the strip being supposed to lend itself to such a torsion), this torsion being done around the longitudinal axis of the aforesaid the cuboid strip. The strip of Moebius is said right or left according to whether it can be comparable with a right or left threading respectively.

In the case of the embodiment of figure 1, volumes with **the Moebius strips are thicker in their middle** (i.e., they would be carried out starting from a rectangular strip of which the thickness would be larger with the middle than at the ends) in order to allow the drilling of holes in their mediums for the insulators and fixing mounting, as explained below). In practice, it is preferable not to twist a wood small plank, but to cut the aforementioned volumes as Moebius strips. Keys volumes are, preferably, regular, i.e. symmetrical compared to their respective centers, and **their total number must be odd**.

All with dimensions the 1 to 16 of the form F is made out of very dry wood, for example of **poplar, of oak**, or an exotic wood.

The applicant noted that the natural materials with fibres directed such as the wood gave the good results, and that **materials such as rubber or the plywood, or synthetic products such as plastic did not produce any substantial result.**

When with dimensions the 1 to 16 is manufactured out of wood, they are assembled mutually, preferably by assembly of the mortise tenon out of wood which can reinforce the assembly, and not exceeding the dimensions of the frame.

The applicant noted that industrially to obtain useful results, the form F was to be such as the circle circumscribed with the formed polygon by **the frame was to have a diameter of at least approximately 250 cm**, the high applied tension, in a way explained below, **with the electrodes being at least 45 Kv, preferably from at least 60 kv, low tensions to 45 Kv having not very industrially exploitable effects.**

Sides 5 and 13 of the frame, with right Moebius strips are drilled of a hole passing by their center and whose axis merges with a radius of the circle circumscribed with the form F. The drilled holes in with dimensions the 5 and 13 are used for fixing of the form F on a mounting, not represented, for example an equatorial or ordinary mounting, making it possible to direct in space the form F. However, one could envisage other modes of fixing of the form F on its mounting.

With dimensions the 3, 7, 11 and 15 are drilled holes, in the same way that sides 5 and 13, in order to allow the fixing of the electrodes, as described below.

Small wood planks constituting the dimensions 1,3,7,8,12,14 16, preferably, have a **width equal to or greater than 20 cm and a thickness equal to or greater than 4 cm, preferably between 6 and 10 cm**. The sides with right and left Moebius strips have, with their extremities 5 preferably, the same thickness as the planar sides, their thickness gradually increasing ends towards the center, up to a value of approximately **at least 8 cm**, this, in order to allow the drilling from with dimensions the 5 and 13 for the fixing of the frame on mounting and the sides

11 and 15 for the fixing of the electrodes.

The applicant noted that one could also favorably influence the effect of amplification by affixing with ankles, volumes manufactured in the same material as frame. In the example of realization represented on figure 1, one fixed on the faces, turned towards the inner one of the form, the sides 1 and 9, volumes 17 and 18 respectively manufactured out of wood.

These volumes 17 and 18 consist of **cylinders with cones on their ends, the point angle of these cones being preferably approximately 140 degrees**, the diameter of the cylinders being low to the length of with dimensions form, and the **height of these cylinders being of about size of a few centimetres**.

On sides 3, 7, 11 and 15 of the frame constituting the fixed form F one the electrodes 19, 20, 21 and 22 respectively, these electrodes being supported by stems electrode holders 23. Electrodes 19 to 22 are made out of electric conductive good material, for example **copper** and are consisted a circular cone 24 whose base is connected to the stem electrode holders 23 by one surface of hemisphere 25.

The point angles of electrodes 20 and 21 are, preferably, of 23 degrees +/- 30 **'** so that the point angles of the cones of the electrodes 19 and 22 are preferably **28 degrees +/- 30 '**. **The length of each electrode** 19 to 22, taken in the direction of their axis, **is approximately 60 to 90 mm**. However, other shapes of electrodes can to be considered.

The stems 23, which are, also, made out of an electric conductive good material, for example of **copper**, and at the ends of which electrodes 19 to 22 are screwed or welded, cross with dimensions the 3, 7, 11 and 15 of the frame constituting the form F through appropriate insulators 26, for example out of glass or porcelain, these insulators drilled with an axial hole having substantially the same diameter that that of the stems electrode holders 23, the stems electrode holders 23 being attached of appropriate way in these insulators 26. **Insulators 26 have a maximum outer diameter of approximately 5 cm** corresponding to the bore practised in sides 3, 7, 11 and 15, and are attached there of appropriate way, for example by joining. **The axial length of insulators 26 is at least equal with the width on the sides which they cross (i.e. the length of the holes bored in these sides), and, preferably of at least twice this width.**

Since with dimensions 3 and 11, and sides 7 and 15 are diametrically opposite and that the hollow polygonal volume consisted the frame is substantially regular, and that the holes bored in these four with dimensions are directed towards the center of this volume and are applied to the center on the corresponding sides, the four stems electrode holders 23 are directed following of the rays of the circle circumscribed with the form F and when they are taken consecutively two to two, are substantially perpendicular between them. Preferably, one adjusts of appropriate way the directions of the stems electrode holders 23 so that **the points of four electrodes 19 to 22 are coplanar**, the plane in which are located these four points not passing the center of the form out ; **distances separating the points from electrodes 20 and 22 and electrodes 19 and 21 are preferably of at least 400 millimeters when applied potential with electrodes 19 and 22 are approximately 45 Kv**, and from **at least approximately 1 metre when this potential is approximately 300** Kv. [*Cubit ...*]

On each stem electrode holders 23, one lays out, between the base of the corresponding electrode

and insulator 26 two volumes 27, 28 substantially ovoidal, in the same material that the form F, i.e. out of wood for the embodiment prefered, the tops with lower angle of opening of the ovoid forms 27 and 28 being directed towards the center of the form F. One lays out outside the form F, around insulators 26, six identical discs 29, being of course that insulators 26 exceed sufficiently of the form F towards the outer one, if not the discs could be directly attached on the stem of electrodes 23. Then, one lays out on the stems 23 two other ovoidal volumes 30 and 31 respectively, whose tops of lower angle of opening are also directed towards the center of the form F. **The discs 29 and volumes 30 and 31 are also realized in the same material that volumes 27 and 28. However, all the materials suitable with the manufacture of the form F can be used to carry out volumes 27 and 28, 30 and 31 and discs 29.**

Discs 29 have, preferably, an outer diameter of approximately 32 cm and a thickness from approximately 1 cm, and are drilled with an axial hole corresponding to the maximum outer diameter of the insulator 26 on which they are threaded, and attached in an appropriate way.

As one sees better in figure 2, representing a volume V which is any of ovoidal volumes 27, 28, 30 or 31, each one of these volumes is drilled of an axial hole T, and axial conical facings 32, 33 are practised with each end of ovoidal volume V, the points being directed one towards the other one.

The angle of the opening 1 of the conical facing 32, practised in the top of wider opening of ovoidal volume, is, preferably of 28 + 30 ' and that of conical facing 33, opening 2, being preferably, of 23 degrees +/- 30'.

P is the depths of conical facings 32 and 33 and L the length, taken in the direction of the axis, ovoidal volume V against the drilling of facings 32 and 33.

L1, L2, L3 and L4 are the lengths L of volumes 27, 28, 30 and 31 respectively. These four volumes are **homothetic**, ratios **L4 / L3 , L3 / L2, L2 / L1 giving ratios of homothety**. In the preferred mode of realization, **L1 = 6 cm, L2 = 15 cm, L3 = 24 cm and L4 = approximately 33 cm**.

The values of the depths P follow the same ratios of homothety that the lengths L. For all ovoidal volumes 27 and 28, 30 and 31, conical facings with opening of approximately 23 degrees are directed towards the center of the form F when these volumes are attached on the stems 23.

In the case of the embodiment quoted above, the **depth P of facings 32 and 33 of volume 31 is 12 cm**, the P1 depths in P3 of other volumes 27, 28 and 30 deducing some following the aforementioned ratios of homothety.

The stems 23 of the electrodes 19 and 22 are connected both to a source (not represented) of filtered and stabilized DC current, positive compared to the ground. The stems 23 of electrodes 20 and 21 are both connected, in a way not represented, with the potential of the ground.

It is clearly understood that one can have on the stems electrode holders 23 other volumes having forms for example those represented on figure 3, these last replacing volumes 27, 28, 30 and 31 and discs 29. One can add volumes also having other forms, or put nothing on these stems 23.

Represented in figure 3 is an alternative of volume which can replace the volumes 27, 28, 30 and 31 represented in figure 2.

The volume 34 represented on figure 3 has a general rhomboidal form, i.e., a form whose outer surface would be that generated by a **round rhombus** around its large axis, the acute angles of this rhombus being on the aforementioned axis. One of the acute angles (#1) of the aforesaid rhombus is approximately **57 degrees 20 ', while the other one (#2) is of approximately 51 degrees.**

Form 34 is drilled of an axial hole 35 whose diameter corresponds to that of the stems electrode holders 23. In the top of volume 34 having the angle of practical opening V one an axial conical facing having an angle of opening 1 of approximately **23 degrees, while in that having the angle of opening 2, one practical an axial conical facing of angle of opening from approximately 28 degrees**. The depths P' of the aforesaid facings conical are equal and are determined, just as the length the of the aforesaid rhombus, taken according to its large axis, in the same way that in the case of the ovordaux volumes represented on figure 1.

When one uses the volumes 34 represented on figure 3, in the place of ovoidal volumes, one can remove discs 29 while obtaining an improvement of substantially equal or great amplification to that obtained with the aforementioned ovoidal volumes.

According to an alternative of the embodiment prefered of the present invention, **one can either insert in the frame, or lay out near this frame, inside or outside the volume which it delimits, a natural inorganic form, of carborundum**.

It was noted that such inorganics makes it possible to **increase the amplification of the device and/or to change the nature of the emissions and/or to confer to the frame the fractal character**, which is a known mathematical character.

For the inorganic natural, one can for example use **proustite, pyragyrite, obsidian**, etc…, as well as several of these inorganics simultaneously. It was also noted that **natural graphite has a strong influence on the fractal character.**

One can also use in the place of inorganic, or in addition to those, of **nematic liquids**. [*Oil, gas, gasoline, water , nitrogen (Lorg Rayleigh) ...*]

It is also possible to add to the frame or near this one of other volumes, preferably out of natural material, for example out of wood, presenting directed fibres, **materials such as rubber not having any noted effect. Such forms not only make it possible to increase the effect of amplification of the device, but also to unify the effects obtained in space and time, and to avoid the creation of freezing conditions for human use.** [*Frost prevention ? ...*]

Such additional forms can for example be cones with point angle determined, forms with character of fractal object, polygons with four, eight or sixteen sides for example, polygons with seven dimensions, hemispheres, etc…

One can also add to the device of the invention, acoustic resonators, lasers for continuous or

rhythmic emission, or many **fluids in movement in conduits of appropriate form**. [*Schauberger ...*]

In Figure 4, one schematically represented another embodiment of the according apparatus to the present invention.

The apparatus represented in Figure 4 comprises two concentric F1 forms and F2 , the F1 form being outside the F2 form.

The **F1 form consists of an octagonal frame** whose with dimensions ones are respectively referred 39 to 46, and form **F2 consists of a regular polygonal frame with sixteen sides** respectively referred 47 to 62.

The frames constituting the forms F1 and F are carried out in same way that the frame represented on Figure 1 and have the same characteristics, single substantially dimensions of these frames are different.

In one mode of realization of the invention, **circles circumscribed with the frames F1 and F2 have respective diameters of 384 and approximately 192 cm**. However, dimensions of these circles, and consequently of the frames constituting the forms F1 and F2 can be larger. If the diameters of these frames are smaller, it would be necessary is to decrease the high applied tension with the electrodes carried by these frames, which would have an adverse effect on amplification, that is to say to take very large precautions of electric insulation.

Also, the forms F1 and F2 are laid out one compared to the other one so that with dimension of the form F2 is with respect to the top ranging between with dimensions the 39 and 46 of the F1 form.

The forms F1 and F2 are joined together between them using spacers 63 which are realized, preferably, in same material that the frames constituting the forms F1 and F2, for example out of very dry wood.

Spacers 63 connect with dimensions the 47, 51, 55 and 59 of the F2 form at the corresponding tops of the F1 form.

The electrodes (not represented) are attached on with dimensions the 49, 53, 57 and 61 of the F2 form, in the same way that in the case of the apparatus represented on Figure 1.

On with dimensions the 47 and 55 of the F2 form one can have volumes 65 and 66 respectively, which can be carried out and laid out in the same way that the volumes 17 and 18 represented in Figure 1, or in a different way.

The axis passing by the centers from with dimensions the 51 and 59 is referred 64, and one can make turn the two forms F1 and F2 with their electrodes and possible volumes associated around this axis using an appropriate mounting (not represented).

To further increase the effect of amplification of the equipment of which two of the possible embodiments are described above, one can **lay out it in a truncated pyramid**, which can be

constructed as a frame, of which the **height is approximately 4,5 m and whose base is square and has approximately 5 metres** in dimension. The proportions of the regular pyramid from which this truncated pyramid is obtained are such as the length L of its oblique sides is equal with C.

C being the length on a side of the base of the pyramid and W the actual root of the equation: X^3 - X - 1 = O, i.e. approximately 1,325. The truncated pyramid is obtained while cutting the top of the pyramid to the quarter length of its oblique edges, i.e. length 1 ' of the oblique edges of the truncated pyramid is equal with 3/4.c.y, two bases of the truncated pyramid being thus parallel between them.

One can supplement this truncated pyramid while laying out around this small base, which is also square, **with a circle**, for example out of wood, of diameter C ", centered on the axis of the pyramid, it being the length of with dimensions of the small base of the truncated pyramid.

One can also have on the oblique edges of the pyramid the wood hemispheres whose diameter is equal with the length of the aforesaid edges, outside the truncated pyramid.

To operate the present invention, one applies with electrodes 19 and a 22 positive potential which one increases gradually from zero up to a maximum value of at least 4r Kv. The effects obtained are all the more substantial as its potential is higher.

However, for the great ones to approximately 300 Kv, it is necessary to take very large precautions of electric insulation, and the dangers of manipulation are increased.

The generator producing the aforementioned positive potential will have to be able to be capable to deliver **a current of approximately 100 microamperes**, and will be able preferably to comprise a protective circuit cancelling as soon as possible the high produced tension if the output current exceeds a certain value, for example 100 microamperes.

It was noted that **the effects enumerated below commence at the end of approximately an hour the carrying under tension of the equipment of the invention, in a ray of approximately 30 metres or more around this equipment**.

Among the noted effects, and whose list is not restrictive, one can quote:

1 -- Local action on the terrestrial magnetic field -- **After approximately half an hour, one observes that the magnetic variation moves approximately 60 towards the west of magnetic north** whatever the applied tension with the electrodes, above of the aforesaid threshold approximately 45 Kv, this rotation of the magnetic variation stabilizing itself with the aforementioned value dependent all the time on application of the potential, whatever the orientation of the frame compared to the ground. However, **if one directs the axis of the frame with 60 degrees west of magnetic north, it was noted that the other effects quoted below occurred rapidly and with a more substantial intensity**.

It was noted a variation of the magnetic slope, but the value of this variation was not fixed.

2 -- Local Action on the gravitation -- With a potential of approximately 45 Kv, it was noted that

the **local gravitation passed to 0,9 times its usual value** to the same location, and that **this gravitation decreased further when one increased the applied potential** with the electrodes of the apparatus.

3 -- Local action on the **index of refraction of the air -- It increases slightly**, and more **especially if the applied positive potential is higher**.

4 -- It was noted that in reactions of combustion producing blast-furnace slag usually, there was **no formation of ash after all the period of operation of the apparatus, and same four days after the suspension of the application of the elevated positive potential** by said electrodes 19 and 22.

5 -- **Reduction in the quantity of fuel necessary in the majority of the reactions of combustion, to obtain the same result**.

It has been reported that with an high tension of approximately **45 Kv, one used approximately 30% less coal to obtain same thermal energy, this reduction being all the more substantial as the applied positive potential with the form is higher**. In the case of motors with explosion using the **gasoline, it was noted a reduction in consumption approximately 50%** compared to a use, in the same conditions, without the apparatus of the present invention.

6 -- **Increase of the coefficient of solubility of a salt in water**, in particular of sodium chloride. Experiments were carried out with dehydrated sodium chloride, while varying the temperature of the water in which one dissolved salt by increments of l0 C, from 10 C with 100 C, the starting water being twice distilled at a pressure above normal atmospheric pressure. It was noted that **one multiplied by 2,1 to approximately 2,3 the coefficient of solubility of sodium chloride with a positive potential of approximately 45 kv.** [*Solar ponds ...*]

7 -- **Increases the speed of growth of the plants and their size**. These increases are variable according to plants but are appreciable. In certain cases, **the factor of increase is at least 2, up to 10.**

8 -- Possibility of **removing partially or completely a catalyst in a chemical reaction** requiring normally a catalyst.

According to another embodiment of according equipment the invention, one associates a main polygonal geometric form, such as the geometric form described above, with other geometric forms, preferably of single geometric forms such as for example the additional forms described above, and **preferably one associates to them an electric and/or electromagnetic and/or magnetic field, these forms being the preference laid out inside a geometric volume which can for example be made out of a molded insulating material** around the said forms.

Without the application of one of the aforementioned fields, one obtains effects relatively not very exploitable, but the application of the one at least of these fields allows one to increase the intensity of the effects obtained, especially when the applied field is higher.

FR2716123
Device for Activating Fluids & Solids

1995-08-18
Classification:- international: B01D53/18; B01J10/00; B01J19/12; B01J19/18; B01J19/24; C02F1/00; B01D53/18; B01J10/00; B01J19/12; B01J19/18; B01J19/24; C02F1/00; (IPC1-7): B01J19/00; B01D53/14; B01D53/78; B01J19/08; C02F1/00; C02F5/00; C03B27/012;- European: B01D53/18; B01J10/00F; B01J19/12D; B01J19/18; B01J19/24D; C02F1/00M

Abstract -- A device is claimed for activating a fluid circulating through a treatment unit between an inlet tank and an outlet tank under the action of at least one compressed gas supply. The treatment unit (2) includes fluid circulation pipes (51, 52) in the form of a curve CN, where N = 2 or more and CN is defined by the following recursive relation: C1 is a left-handed cycloid in the ortho-normal reference frame; and for all integers N greater than or equal to one, CN+1 is a left-handed cycloid in the curved reference frame of CN. Also claimed is an activation process using the above devices, where the fluid is circulated through the treatment unit using compressed gas at a pressure of 1-8 bar. Also claimed are: (1) use of the above device for desalinating and purifying water; (2) use of the above device for treating fumes; (3) a process for activating glass with a fluid activated as above, comprising heating the glass to 850-1800 (pref. 900-1000) deg C and immersing it in the fluid; and (4) a process for activating metals, ceramics, hard plastics and terracotta with a fluid activated as above, comprising immersing the material in the fluid and cooling it below -40 (pref. -80) deg C for at least 1 hr.

Description --

The invention is in the technical field of the activation of fluid and the solid ones. The activation indicates treatments making it possible to modify certain physical and chemical properties the fluid ones and the solid ones, these last said being then activated.

One knows by the FR-A-966735 a process and equipment allowing to exert an influence on the modifications of state of the material, especially by the action of suitably directed emissive apparatuses.

It is known that there are also phenomena of activation due to the presence of forms, fixed or movable, and presenting a minimum of symmetry in plane or in space.

Moreover, one knows by at-A-113 487, AT-A122 144 and AT-A-134 543 [Schauberger], of the water pipelines of else particular form, allowing the regulation of torrents or river.

The object of the invention is to propose a device presenting characteristics strongly different from those of the apparatuses of the former art, for an effective activation of fluid, as well as purification of some of those, like water or smoke. It is a question of not subjecting these fluid for a purpose of concentration and elimination by density, but **with the action of centripetal swirls due to the very accurate forms** which the different process modules of the according device present in the invention.

The invention has as an object a device for activation of the fluid circulating one between a tank of inlet and a tank of extended within an unit of treatment, under the effect of at least a

compressed gas, in which the unit of treatment includes conduits of circulation of fluid appearing itself as a CN layer, with NR entire great or equal with 2, CN being defined by the following recurring relation

- C_1 is left cycloid in the referential orthonormal one,

- for any NR entire great or equal with 1, CN+1 is cycloid left in the referential one curves bound with CN.

For left cycloid, it is advisable to use the curve followed by a point pertaining to a ray of a circle, when this last rolls on straight and turns around this same straight. The cycloid one said stringent when the point belongs to the circle, is lengthened when the distance between the point and the center of the circle is great with the ray, shortened when this distance is low with the ray.

The inventor noted that, of surprising manner, if one compels fluid **under pressure from 1 to 8 bars** to circulate within the according conduits with the invention, this fluid is activated, namely that its physical and chemical properties are modified.

This activation persists and is stabilized, same when the fluid one does not circulate any more, when **the conduits are made out of particular alloys**. This is why it is beneficial to use as a constituent material of these conduits, an alloy between a base metal chosen among **copper, chromium, iron, cobalt and nickel**, with the heavier metals added in very small quantity in weight. It is preferable to consider base metal copper, and of the heavier metals constituting alloy will be taken among those possessing an **atomic number Z ranging between 38 and 45** or pertaining to the rare earths.

The activation is reinforced when the air supplies compressed are also appeared as curves CN, since the compressed air being used to put the fluid one to treat in movement, is itself activated.

A mode prefered of realization of the invention consists in using, for the construction of the final curve CN, of elongated left cycloid.

The inventor moreover noted that the bound phenomenon of activation to the shapes of the curve CN, present a variable effectiveness according to the value of NR. Thus, the activation is maximum in the case of conduits in the form of a C_3 curve, namely in the case of cycloid left lengthened final C3 being rolled up around cycloid left lengthened intermediate C_2 itself rolled up around cycloid left lengthened C_1 departure.

Various other characteristics and benefits of the invention arise from the description made below in reference to the annexed drawings which show, as nonrestrictive example, an embodiment of the object of the invention.

- **Figure 1** is an overall schematic sight of the device of according activation to the invention.

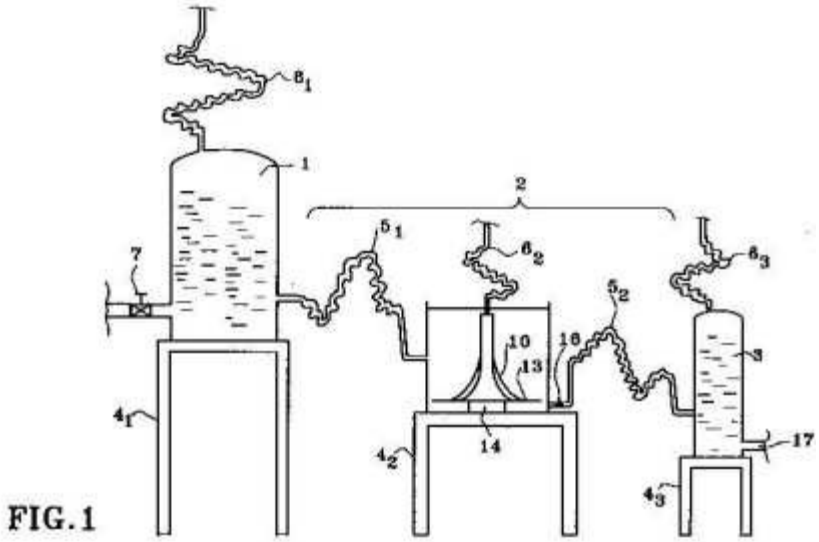


FIG.1

- **Figure 2a** illustrates the construction of cycloid left lengthened within the meaning of the invention.

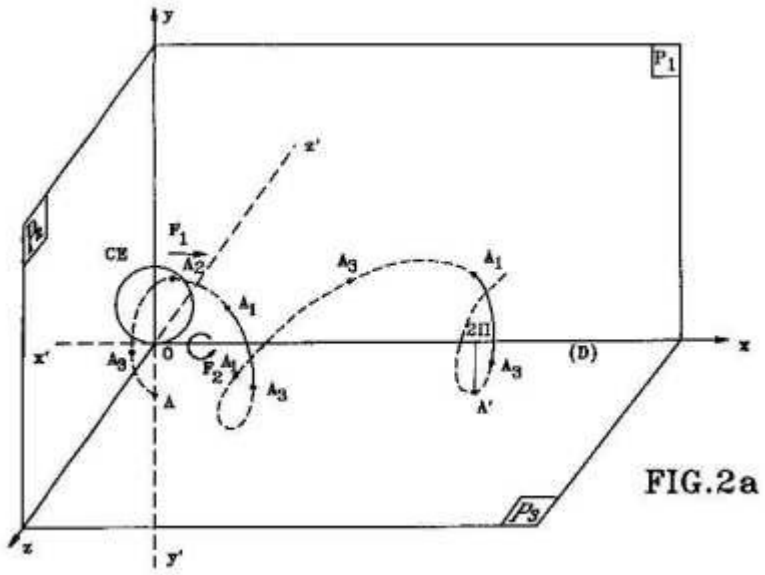


FIG.2a

- **Figure 2b** is an increased sight appearing the profile of the conduits of circulation of fluid and air supply compressed, according in the invention.

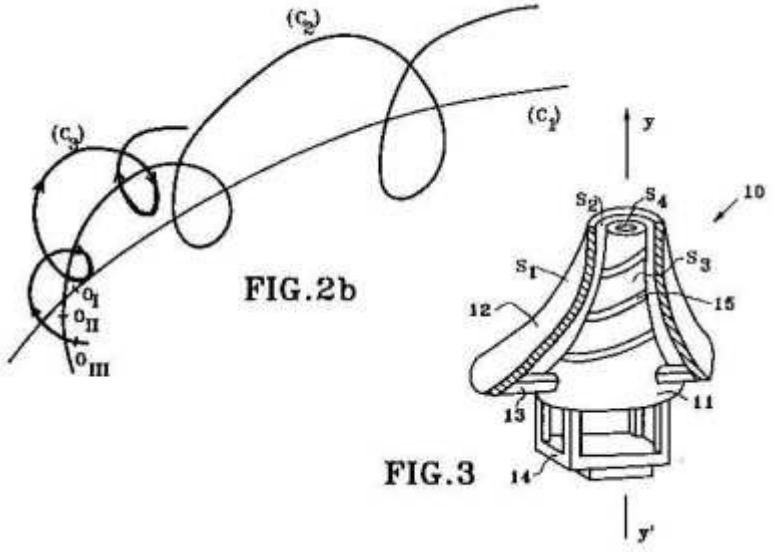


FIG.2b

FIG.3

- **Figure 3** is a view of two hemispheres for the invention.

As shown in the Figure 1, the device of activation of fluid, includes a tank of inlet 1 of fluid to activate, an unit of treatment 2 as well as a tank from extended 3 of fluid treatment.

It is to be noted that these three entities constituting of the installation, rest on frames, respectively 41, 42 and 43, with an increasingly low height progressively with the circulation of the fluid one.

Thus, this last is facilitated by the action of gravity.

The whole of the device includes/understands two conduits 51 and 52 of circulation of fluid inserted in the unit of treatment 2, like three conduits 61, 62 and 63 of compressed gas arrival intended to ensure the circulation of fluid along the installation and respectively laid out in relation to the tank of inlet 1, the unit of treatment 2 and the tank of exit 3.

The specific profile and the nature of these conduits 5, 6 are substantial for the invention. As represented on the figure 2b, each one of these conduits present in the shape of a C_3 curve formed by cycloid left lengthened final rolled up around elongated left cycloid intermediate C_2 itself rolled up around cycloid C_1 departure.

For the construction of C_3, it is first of all a question of considering cycloid C_1, such as illustrated in Figure 2a.

Within the sense of the invention, cycloid C1 in the orthonormal reference mark (x, y, z) results from the movement of a point A located on a diameter of circle EC but at a great distance from the center to the ray, when this circle rolls on straight D (which corresponds in the present case to the axis of the abscissae) in the direction of the F_1 arrow and at the same time turns around this straight D following the F_2 arrow. On the Figure 2a, the features dotted lines are reproduced the parts of the curve which are invisible if one considers opaque plane P_1, P_2 and P_3, whereas the

full features correspond to visible parts of the curve, namely whose points present at the same time a positive abscissa, ordinate and a dimension. It will be noted that the period of cycloid is of 2K what corresponds then to the A' point and that circle EC carries out a full rotation around straight over a length of 2s radians. The points A_1, A_2 and A_3 represent the intersection of the curve with respectively planes P_1, P_2 and P_3.

It is averred that the layout of C_2 involves a slight modification of the form of C_1 which is not thus celongated ompletely any more left cycloid. I_1 is the same when one passes to the development of C_3 or C_2 and again C_1 are slightly deformed. There is not thus a stringent construction like that which one applique in the theory of the said objects fractals but it is to some extent a generalization of the concept of fractal object. One is presented with a new class of objects.

Nevertheless, about the curves C_1, C_2, C_3… one will keep the denominations of cycloid.

It is also possible to consider shortened left cycloids, same as the periods of complete rotation of the circle around the straight one which are different of 2 pi radians, for example ranging between pi and 2 pi radians.

As the Figure 2b indicates it, the C_1 curve as built above, is used then as support with the curve C_2 which is cycloid left lengthened in the referential one curves bound in C_1, C_3 being carried out in the form of cycloid left lengthened in the referential one curves bound in C_2. The parts of C3 located nearest of the observer are represented in thicker feature.

The conduits of circulation are appeared as such a C_3 curve and allow a responsive activation of fluid the through one. Indeed, each element of fluid being at a given point P_3 of C_3, behaves as if it were at the same time in P_1, P_2 and P_3, P_1 and P_2 being far away from the respective origins O_l and O_2 from C_1 and C_2 of an equal distance to that separating O_3 from P_3, although the curves C_1 and C_2 do not exist materially in the installation.

The conduits of circulation 5 present an hexagonal transverse section, or type of a curve of the third degree presenting of the points of inflection.

In order to stabilize the phenomenon of activation, **the conduits are made out of bound copper with 2% in weight with for example of indium, molybdenum**, etc…

Conduits 6 of compressed gas arrival are also formed in a C3 curve. However, if it is beneficial to carry them out this kind since one active the compressed gas which itself active all the more the fluid one, it is not a question of an absolute requirement.

Thus, these conduits of gas arrival can present a conventional profile, such as helical serpentine or straight tube with circular section.

The tank of inlet 1 whose capacity is selected according to the possibilities of the installation, is fed, via a valve of inlet 7, into fluid to treat whose circulation is ensured by compressed gas coming of the conduit 6_1 previously described.

The unit of treatment 2 is laid out immediately downstream from the tank of inlet 1, and

includes, in addition to two conduits 5 of circulation previously described, an intermediate tank 8 laid out between these two conduits 5. This tank is the seat of an additional activation conferred by the presence of a system 10 of two hemispheres.

As shown in the figure 3, this system 10 includes two thereafter half hemispheres 11 and 12, refer respectively inner and outer.

These two half hemispheres are hollow, thus defining four surfaces
- S1 the outer surface of the outer hemisphere 11
- S2 the inner surface of the outer hemisphere 11
- S3 the outer surface of the inner hemisphere 12
- S4 the inner surface of the inner hemisphere 12.

Each surface Sn, for *n* of 1 to 4, corresponds to surface truncated with constant curve generated by the curve of parametric equation:

$x = a_n (t - th\ t)$

$y = a_n / cht\ ;\ a_n > 0$

rotating around its asymptote yy', for *n* from 1 to 4 and $a_4 < a_3 < a_2 < a_l$

Abscissa *n* will have for example like maximum value $5a_n$ with $6a_n$.

System 10 is adapted to enter in rotation around its asymptotic axis yy', for example under the effect of a power unit 14.

Both half hemispheres 11 and 12 are subjugated by means of two cross-pieces 13 sparing a passage making it possible fluid to circulate between surfaces
S_2 and S_3 in the form of a centripetal helical movement.

A throat 15 moreover is spared in spiral with the S_3 surface level, so that rotation can be generated by the fluid arriving one under pressure without the assistance of the group 14. It is also possible to carry out such a throat on S_2 surface, in the place of the throat spared on S_3 or to complement of this last.

The thickness of the half hemispheres is selected so as to guarantee a sufficient rigidity of the system according to the number of revolutions to which this last east compels to turn.

The obstruction of cross-pieces 13 is as reduced as possible, in order to domestic a passage between the two hemispheres which present of maximum dimensions.

Another possibility consists in using only one half hollow hemisphere on the inner surface of which a throat in spiral is laid out.

Like stated in Figure 1, a conduit 6 of compressed gas describes previously emerges in the vicinity of the system of hemispheres, on the side of the section of lower dimension of these last, in order to drive back the fluid circulating one between surfaces S_2 and S_3, like inside hemisphere

12.

In the case of a single hemisphere, the compressed gas arrival is carried out so as to drive back the fluid circulating one inside the hemisphere.

Downstream from this last the tank 3 is laid out of extended of fluid which is capable to be delivered under pressure via the gas 63 conduit described previously. The fluid treaty is distributed by means of the valve from extended 17.

A tap 16 located at extended of tank 8, makes it possible in closed position to prolong the stay of fluid in the tank, and allows in open position the passage of fluid in the second conduit of circulation 52.

The conformation of the device of activation according to the invention is capable different modifications.

Thus, the specialist of the profession is capable to provide the unit with treatment of conduits of circulation or additional systems of hemispheres, or to add another gas arrival compressed to the level of the tank of inlet. All these modifications contribute to improve the effectiveness of the activation.

The operation of the described installation cidessus allows the carrying in work of a process aiming at activating the fluid ones.

It is a question of making circulate the fluid one to treat within the installation by means of compressed gas, under a pressure ranging between 1 and 8 bars. A maximum activation is obtained when this pressure is applied of sinusoidal manner or in square waves. It is possible to make circulate fluid uninterrupted, by leaving tap 16 in open position.

Another possibility consists in turning off this tap 16 as well as the valve of inlet 7 and making circulate a quantity limited of fluid within tank 8, and in particular between the two half hemispheres 11 and 12.

Then, it is a question of driving back this quantity of fluid per opening of tap 16, and of renewing the fluid one to treat by opening the valve of inlet 7.

It is to be noted that circulation between the two half hemispheres 11 and 12 can be ensured in the two directions, by modulating the pressures to which the compressed gas in the respective conduits 61 and 62 is delivered.

A more labile activation of fluid to treat can be conferred by the action of electromagnetic rays.

Those are applied on different portions of the unit of treatment within which circulates fluid, pendent the one two hours minimum duration, preferably three hours, and present a length of wave belonging to the one of the following intervals: 3800 to 3860 A, 4400 to 4480 A, 5500 to 5600 A and 8000 to 8700 A.

The according device and the process with the invention are capable numerous applying, in addition to the activation of fluid itself.

It is indeed possible to apply the invention to purification and in particular, with the **desalination of water**.

For this purpose, it is preferably advisable to place, downstream from the tank of inlet, a filter intended to eliminate the coarse impurities.

Moreover, this device allows an **effective treatment of industrial fume**s showing a high rate of pollution.

In the two cases mentioned above, the fluid treaty, namely respectively **water and smoke**, is at the same time purified and activated.

The invention also finds its applying in the **activation of glasses**. For this making, one uses fluid, preferably oil or oil, activated by means of the device and process described above, in which one carries out a hardening of glass placed at a temperature of 850 C with 1800 C, preferably 900 C with 1000 C.

The activation of glass appears as of hardening, and develops at the time of the return to ordinary temperature.

After examination with the electron microscope with scanning, one notes the presence, within glass, of microbubbles of which the diameter and the distribution characterizes the process of hardening thanks to activated material.

It is possible to obtain **effects of ageing of products of alcohol wine** contained in containers made out of such activated glasses. Glass bottles activated containing of alcohols such as cognac and Armagnac, transmit the activation to liquid which lose in some weeks a degree of alcohol; their color becomes amber, their ethyl taste disappears as in the case of aged alcohol after several years.

These activated microbubble glasses transmit their properties to the forms and objects which can be associated for them. Thus, microwave furnaces associated with such glasses activates the food which they heat. One can also apply the invention with the glazings of greenhouses, of buildings, with the bezels with colorless and coloured glasses, windshields of cars and to bottles intended for containment of liquid food, or of the fragrances, or solutions of medical treatments.

The invention finds moreover its applying in the **activation of the alloyed pure metals or, ceramic, the hard plastic materials and the fired grounds. For this purpose, it is advisable to plunge material to be treated in fluid activated as a preliminary, preferably of oil or oil. Then, it is a question of treating the unit to low-temperature, namely - 40 C and preferably with - 80 C, for at least 1 hour**.

The increase at ordinary temperature by no means affects the activation of treated materials. Moreover, these last is capable to propagate their properties with their contents, in the through

case of containers for example, and also with the electromagnetic waves these containers or reflecting on their surface.

The invention is not limited to the examples described and represented, since various modifications can be brought there without leaving its frame.

Leon SPRINK Space Activator

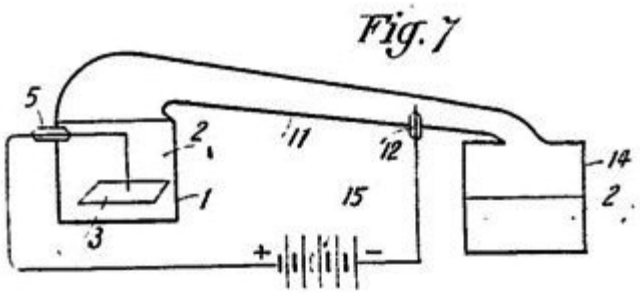
I suspect that this is a Time Generator, per Kozyrev...

80% Reduced Time of Reactions, 50% Reduced Calories

Leon Sprink **was a Russian engineer who operated a cement manufacturing plant in France circa 1950. He received several patents for a simple method to create a type of electric field that accelerates chemical reactions.**

In one example given by Sprink, "One month after the setting in operation of the apparatus, the duration of the reaction, which normally is 24 hours, had fallen down to 3 hours and the saving in calories to be supplied for the reaction was 50%… The field also affects the states of matter such as solubility and crystallization, distillation, reduction of metallic ores, etc..."

In the simplest form of the invention, Sprink used a grounded container placed in an electrostatic field. More control and power was obtained with geometric arrays of positive electrodes mounted diagonally from grounded electrodes.

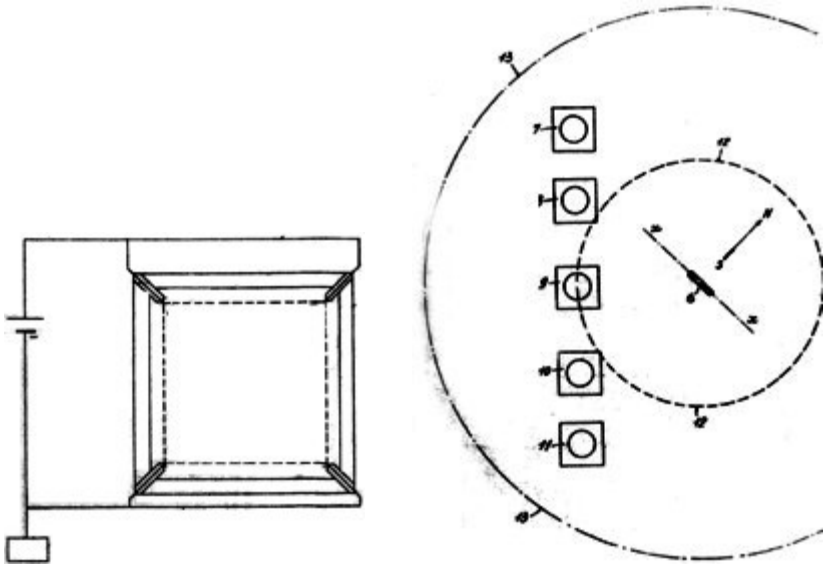


...

According to Sprink's British Patent # 685,522, "Method of and Apparatus for Carrying out Chemical Reactions --- The set of emissive electrodes of the generator are arranged in one or more planes according to a fixed direction; the latter depends on the position and may depend likewise on the character of the reaction or change of state contemplated, as well as the effect wanted. For the speeding up of reactions such as the manufacture of cement with clinker as a constituent, the manufacture of lime, or saponification, the best direction will be substantially that of the plane at right angles to the direction of magnetic north at the place in question…

"Cement is produced under normal conditions in kilns which are subjected to the influence of crossing fluxes produced in a plane at right angles to the horizontal component of the earth's magnetic field, each of the fluxes being produced by silent electric discharges between two opposing pointed electrodes having a potential difference of 1,000-160,000 volts derived from a source of direct current, the cement kilns being outside the paths of the fluxes. The apparatus for producing the fluxes is operated continuously for twenty days before cement making is commenced, the reaction time then being reduced from 2 1/2 hours to one hour..."

The form (e.g., a cube) was mounted upright and aligned East-West. 1000 to 5000 KV of positive charge (per meter of electrode separation) was applied for two weeks or longer to establish a zone of activation, spreading up to 60 meters :



...

According to Leon Sprink, "The zone in which chemical reactions are carried out, under conditions of temperature and pressure normal to the reactions, is subjected to the influence of crossing fluxes produced in a place at right angles to the horizontal component of the earth's magnetic field, each of the fluxes being produced by a silent electric discharge across two opposing pointed electrodes having a potential difference of 1,000 to 160,000 volts derived from a source of direct current, the reactants being outside the paths of the fluxes. Examples relate to the saponification of tri-stearic with super-heated steam, the production of cement and the reduction of iron and aluminium ores, the reactions in each case being carried out in reactors which, according to their position, are 3 to 60 metres from the apparatus producing the fluxes, such apparatus having been in operation for 20 days before the reactions are commenced.

Large units also allegedly demonstrated "anti-gravitational" effects, and ultraviolet light became visible in the diagonals between the electrodes. Sprink called them “St. Andreas crosses”. By varying the position or form of the apparatus, various effects were obtained, “such as speeding up, stabilization, or alteration, in the change of state of matter”. The electrodes are “arranged in couples and distributed along the diagonal lines of geometric figures such as square, rectangles, rhombi, cubes, prisms, etc.” Rectified AC may be used.

Sprink’s associate Jacques Ravatin received French Patent # 2,421,531 for his similar “Apparatus for Amplifying Emissions Due to Shapes... The apparatus comprises a polygonal frame with sixteen sides, with four electrodes to generate a very high electric field inside the frame . After half an hour, effects on certain physical parameters occur within a radius of several tens of meters : action on the earth magnetic field, the gravitation, the air refraction index, the speed of plant growth, etc...”

Areas may be insulated from the effect of activation by shielding with rubber or resin. Metals, wood, and structural material (viz., bricks, stone, cement) are pervious to the phenomenon of space activation. The Russian astrophysicist Nikolai Kozyrev reported similar properties in his epochal *Experimental Study of the Properties of Tim*e. Accordingly, it quite possible that the *Space Activator* also is a *Time Generator* !

The *implications* for energy economy are... "revolutionary" : 80% Reduced Time of Reactions, 50% Reduced Calories ... The *implementations* for energy economy are... delayed...

Excerpt: Preface (by Raymond Abellio) in Armand Babault: *Gold of a Thousand Mornings*

...To speak of activation of space gets one decidedly nowhere. It is simply a picturesque and handy term, yet one which is heard more and more often. I first encountered it in the description of the patent taken out in 1950 by the Russian engineer Sprink, who runs a cement-manufacturing company in France. In it, he states that the creation of an electric field nearby greatly speeds up reactions inside his ovens. He is unable to explain why...

KeelyNet Archives

Jean-Pierre Lentin (lentin@imaginet.fr)
(21 Jul 1998)

Hi all, and wow ! After all those years, I finally met Mr Jacques Ravatin. Just got back from the meeting, and oh-boy-am-I-thrilled ! Now, the name is probably unknown outside of France, but wait... I kept hearing about Ravatin, his group Ark'Hall (now named Eurek'All), his books (some of them under the pseudonym of Vladimir Rosgnilk), his theories and experiments... He is a 63 years old mathematician and physician, one foot in conventional university, the other in weird science BIG TIME - shape power, sacred geometry, lost technology, incredible devices that warp space-time... He dug out an impressive quantity of obscure patents and forgotten inventors, some of them you all know (like Keely, Lakhovsky, Schauberger), some others you probably don't (like Leon Sprink, Louis Boutard, Max Picard). He experimented with the Leon Sprink device, an orthogonal electromagnetic array that, correctly oriented, produces spectacular and very weird antigravific and bio-chemical effects. Sprink died in poverty in the early 1970's. There are patents for his devices, rumour said the patents mysteriously disappeared, but Ravatin just told

me the rumours are crap and the patents are still available. I'll have to check that at I.N.P.I., the French patent office... Stay in tune !

To put it very briefly, it was 4 metal point-like electrodes, disposed on the 4 corners of a square box (of non-conducting material - Balsa wood was often used), polarity opposite across the diagonals (diagonal size 30 centimeters of 1 meter), linked to a DC high tension generator (5000 to 160000 volts, depending on model size and desired effect). Effects were felt all around the devices (at 10 or 60 m distance) : accelerating industrial chemical reaction like cement making ("clinkerisation"), saponification (soap from fats), and metal ores reduction. For the big device with the weirdest anti-gravific effects, the Sprink created a cumulating effect by running the device for days (15 days to 2 months) : concentric zones of influence would slowly unfurl, violet light would be visible along the diagonals ("St-Andreas crosses") and the influence would persist for days after the current was switched off ! Influence is claimed to be dramatic on all sorts of chemical reactions and also reactions of changing states of matter, like fusion, dissolution, cristallisation, pectisation, coagulation... The Sprink reckoned they achieved zones of "activation" (adding that this expression was purely an analogy, as &quotthe scientific nature of the phenomena cannot be precisely and rigorously defined at this time by the inventors").

---

http://pagesperso-orange.fr/intelec/phosphenia/Francais/enel.html

L’émergence de l’Enel ou l’immergence des repères

TOME II --- (Livre relié in-4° de 340 pages dactylographiées)

Léon SPRINK, formes et champs électriques, par J. RAVATIN

Sa jeunesse – La fabrication des savons à haut pouvoir détersif – Les travaux menés avec son épouse – Leur appareil à quatre électrodes – " Le petit soleil " - Liaison avec certaines aurores boréales et des tremblements de terre – Les harpes éoliennes – La structuration des pierres.

Sur les travaux de Léon SPRINK et Marie-Thérèse SPRINK, par Pierre. SMIRNE

Un compte-rendu historique relatif à un ensemble de divers dispositifs destinés à améliorer certaines réactions chimiques, thermiques, métallurgiques et dont le but est une économie énergétique … et financière dans le monde futur.

Introduction

Chapitre I --- Principe des dispositifs Sprink-Ravatin réalisés expérimentalement en maquettes opérationnelles et avantages pratiques.

Chapitre II --- Différents types d’observations et d’expériences ayant amené les demandes de brevets.

Remarque générale – Comment L. SPRINK fut amené à s’intéresser au problème des formes – Expériences fondamentales de SPRINK – Origine de l’industrialisation et amélioration du dispositif de SPRINK de 1923 à 1950 – Tentative d’élaboration d’une théorie devant la complexité des phénomènes – Arrêt des travaux théoriques.

Chapitre III --- Suite des travaux de SPRINK- Nouveaux développements – Abrégé descriptif et principes expérimentaux de l’invention de J. RAVATIN – Effets constatés sur la maquette opérationnelle de J. RAVATIN – Le dispositif de J. RAVATIN en regard de la biologie – Contrôle du bien fondé des résultats obtenus par J. RAVATIN – A voies nouvelles, sémantique appropriée – Envisageons le futur d’une société post-industrielle.

Canadian Patent # 580548
(= DE 868592 = GB 685522)

METHOD AND APPARATUS FOR EXERTING AN INFLUENCE ON REACTIONS AND CHANGES IN THE STATE OF MATTER

1959-08-04

This invention relates to an improved method and apparatus for use in the treatment of matter for the purpose of changing its state, and more particularly is directed to a novel method and apparatus adapted to influence the changes which take place during chemical reactions, combinations and dissociations, and further those treatments in which the chemical composition is not modified, such as fusions, dissolutions, vaporizations, crystallizations, pectizations, coagulations, etc.

It has now been discovered that treatment of the kind mentioned, when carried out in an electrically generated field, or activated space of a type to be more fully explained later, the normally expected results are materially influences in a desired manner, such electrically generated field or activated space being obtained by an apparatus, remote from the apparatus in which the material to be treated is contained, which comprises a minimum of two sets of opposed electrodes of opposite polarity positioned so as to cause the flow of electrical influences of the two sets to meet at a common point as more particularly pointed out hereinafter.

By use of such apparatus and the field thus generated novel and unexpected results have been obtained in the treatment of materials at points substantially removed from the generating apparatus.

We have previously described a method and apparatus capable of exerting an influence on chemical reactions which method consisted in locating the reacting medium into an earthed container which itself was paced into an electrostatic field, an electrical connection between said medium and the outer atmosphere being provided by means of an insulated electrode.

Our works and experiments have enabled us to make it clear that, if some results can be obtained with such previous dispositions, these results are not the same nor are they regular because of the changes in the internal equilibrium of the materials in reaction inside the apparatus, they depend upon various influences outside the apparatuses and cannot be applied to a large number of industrial problems.

On the contrary, with method and apparatuses according to our present invention, it becomes possible to obtain improved and novel results which are regular and of an easier industrial realization.

According to a first object of our invention we exert such an action in locating said medium in the neighborhood but apart from an apparatus, giving out two or more beams of corpuscles more particularly corpuscles carrying charges like electrons by means of at least two sets of opposed electrodes of opposite polarity positioned so that the said beams will meet in a localized zone of space. That localized zone becomes the center of phenomena, hereinafter called ‘activation of space phenomena’, which cause modification in reactions and changes of state of matter.

Another object of our invention consists in the step of orienting that geometrical figure formed by the apparatus in such a direction with regard to the magnetic north as to obtain the most satisfactory results, which direction will be dependent on the intended operation.

By varying the direction or the conditions of the emission of corpuscles, such as the position, dimensions or forms of the apparatus and of the electrical conditions under which it is to work, it

will be possible to modify the character or the direction of the activation and this, bring about various effects such as speeding up, stabilization, or alteration, in the change of state of matter.

According to another feature of the invention, instead of placing the reacting medium under the influence of an electrostatic field, i.e., between the plates of the apparatus creating that electrostatic field, we localize it apart or even remote from the zone where the meeting of the aforesaid corpuscle beams is made to occur, the ranges of distances from this zone which are effective being selected according to the operation to be performed.

According to another feature of the invention, te geometrical figure formed by the emitting apparatus is oriented relative to the magnetic field of the earth in a direction which depends upon the operation to be performed.

Moreover, we have established that if reactions or changes of state of matter are subjected, for instance, to the action of certain corpuscles carrying charges, more particularly by taking steps as will be explained hereinafter, the effect produced when these electrical phenomena are applied is comparatively small and sometimes may be negligible altogether; but tat on the other hand, if their application is sustained continuously over a long period. For instance over 15 days to 2 months, there will be a progressive setting up of concentric areas around the apparatus, in which the space has taken on properties of activation and if the matter or reactive mixture is brought int these areas, under normal conditions of temperature, pressure, etc., the speeds of reaction or changes of state are influences to a very high degree by the mere fact that they take place in the activated space. This influence persists even after interruption of the electric circuit that is the source of activation, so that the area remains activated, and this activation only fades out after an appreciable time after the cessation of the electrical impulse that brought it about.

Consequently, in accordance with the invention, the next step consists in activating the working space of the equipment in which the reactions or changes of state are to occur, well in advance of the beginning of the actual activation; the influence on the change of state of the matter will take place when the required period and degree of activation will be reached, and then, during the whole duration of the treatments contemplated.

It must be remarked that the required strength of activation varies according to the character of the reactions or changes of state in question and that the effect sought for only builds up from the moment when this degree of activation is reached. A decision will be made, according to this required degree, in regard to the characteristics of the equipment productive of the activation phenomenon and more particularly with reference to the voltage at the electrodes of the apparatus and their distances to the point where the reaction or change of state is to take place.

As an example and without this declaration being regarded as imposing any restriction to the invention, it may be pointed out that in the manufacture of cement utilizing the formation of clinker as a constituent step a sufficient degree activation of the space has been obtained, at the end of 5 weeks at a distance of 50 meters from a productive apparatus working under a voltage of 50,000 volts.

It should be observed, in what has gone before, that the words ‘activation of space; must only be taken in the sense of their likeness in function but not in origin, since the scientific character of the established phenomenon cannot be clearly defined, at the present time with a strict degree of exactitude.

The invention comprises, further, means for effecting this activation of the space which means will be hereinafter described in detail with reference to the annexed illustrative drawings which

show diagrammatically only some examples of realization of our invention and which cannot be considered as a limitation.

Fig. 1 is a diagram of an embodiment of the apparatus.

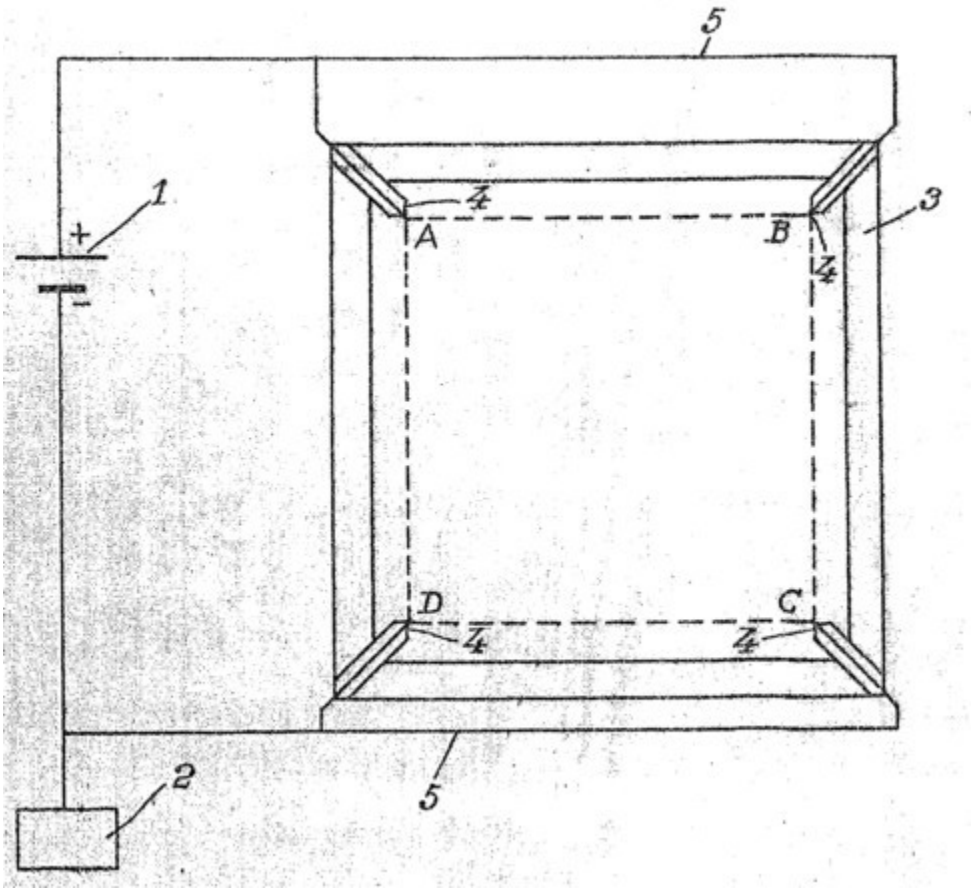
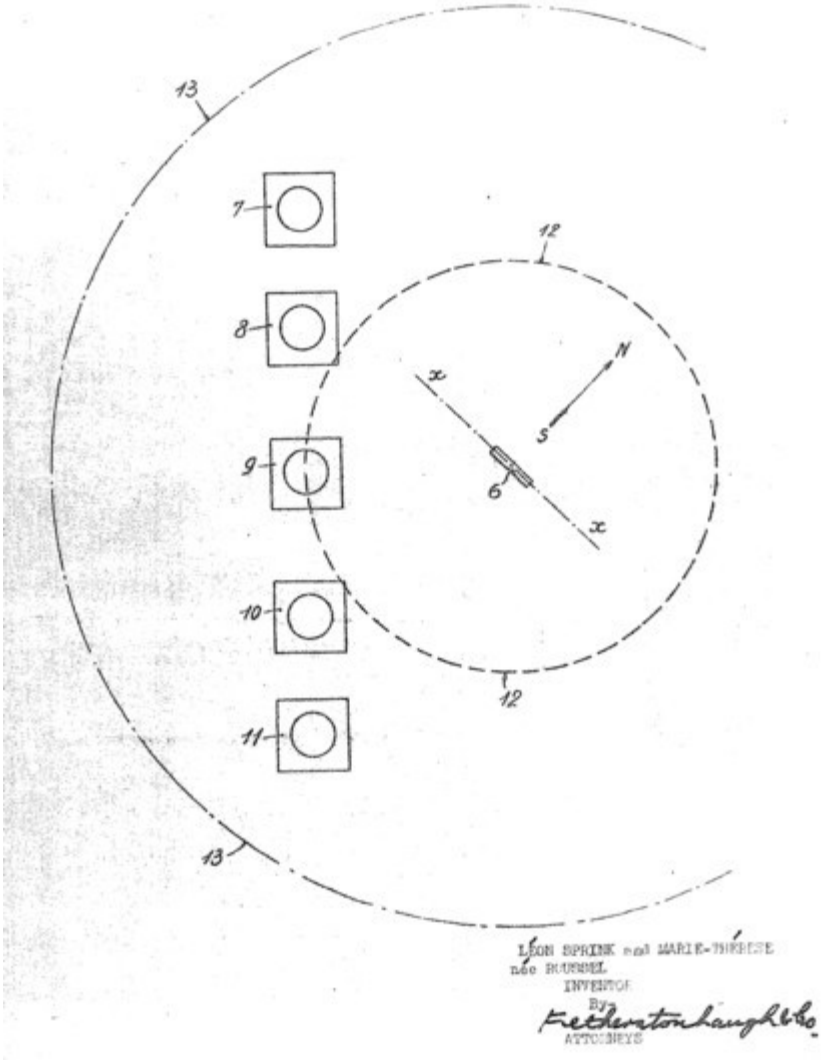


Fig. 2 is a diagrammatic plane view showing the respective arrangement of the said apparatus with regard to a set of kilns for lime production.

Fig. 2



Referring to these drawings, it will be made clearer that our invention can be performed through the medium of the following new and improved means:

(a) First of all the intended activation will be obtained by means of emissive apparatuses suitably headed such as electrodes arranged in couples and distributed along the diagonal lines of geometric figures such as square, rectangles, rhombi, cubes, prisms, etc.

Use may be made more particularly for the formation of these emissive apparatuses , of a frame carrying a certain number of fine metal points arranged in sets of four at the vertices of a square and connected respectively in sets of two to opposite poles of a voltage supply.

Thus, for example, as on the embodiment shown in Fig. 1, 1 is a DC generator at high voltage of which the negative pole is earthed at 2, the frame of non-conducting material acting as carrier for four conducting points 4 arranged at the vertices of a square A,B,C,D, these points 4 being connected in pairs by conductors 5 to the two poles of the generator I, so that the points located

respectively at the two ends of a diagonal line AC or BD are connected one to the positive pole and the other to the negative pole.

(b) The productive apparatuses may be perfected by linking up the emissive electrodes (or equivalent) to one supply of DC voltage, preferably positive, the other being earthed.

It will be possible, more particularly, to establish a positive direct voltage, although undulatory by connecting up emissive electrode through the medium of a rectifier on an alternating current main.

(c) The emissive electrodes of one of the poles are connected to a suitable voltage supply (positive for instance) and the electrodes of opposite polarity to a natural or artificial body of water, in order to establish an electrical ground connection that is as near to perfection as is possible.

(d) The set of emissive electrodes of the generator are arranged in one or more planes according to a fixed direction; the latter depends on the position and may depend likewise on the character of the reaction or change of state contemplated, as well as the effect wanted. **For the speeding up of reactions** such as the manufacture of cement with clinker as a constituent, the manufacture of lime, or saponification, **the best direction will be substantially that of the plane at right angles to the direction of magnetic north** at the place in question.

In accordance with our invention, the electrodes may be arranged on a swiveling frame; change of direction will permit, in fact, the character of the activation of the space to be varied and consequently to alter the influence exercised on the changes of state or reactions.

(e) Certain points on apparatus may be shielded from the effect of activation mentioned above, although they are in the activated area, by means of screens or jackets of insulating material; this insulating material will be preferably rubber or resinous material. The inventors have established, in fact, that the metals, wood, structural material (bricks, stone, cement) are pervious to the phenomenon of space activation, while rubber apparently presents an impassable barrier.

It may be possible, more particularly, in accordance with the invention, to set up apparatus in restricted areas by furnishing such apparatus with impervious walls or partitions of suitable shape made of rubber or resinous materials.

For the practical use of our method, one will take the following steps:

The apparatus, such as that shown in Fig. 1, or its equivalent is set up at a point 6 (Fig. 2), located apart from the kilns or other apparatus 7,8,9,10,11, in which the reactions to be influenced are performed. That distance may practically vary from about three meters for the most proximate kilns to sixty meters and even more according to the power of the apparatus 6; the latter is oriented so that the plane x-x formed by the electrodes is substantially perpendicular to the Magnetic North direction.

When the voltage has been set up for a protracted time, the influence of the inventive apparatus becomes noticeable on the nearer kilns, for example on those which are inside a perimeter represented in dotted lines at 12 (Fig. 2); then the effect extends progressively to the farther kilns, in zones concentric to the apparatus 6, to a limit which depends among other things on the character of the reactions and the power of the apparatus.

The invention, of course, is in no way restricted to the method of realization as illustrated and described which is only given as an example.

For example, instead of making use of four electrodes, use might be made of eight points arranged at the vertices of a cube.

Such a device may be employed for the speeding up of various reactions as shown in the following examples:

Example I

Use has been made of four points 4 of which the distance diagonally (AC or BD) between the points was 0.50 meter. The voltage supplied by the generator 1 was 5000 volts. The apparatus placed inside a house was arranged in the proximity of a set of autoclaves employed for the saponification of fatty substances. The distance from the apparatus to each of the autoclaves was 3 to 10 meters according to the position of the latter. One month after the setting in operation of the apparatus, the duration of the reaction, which normally is 24 hours, had fallen down to 3 hours and the saving in calories to be supplied for the reaction was 50%.

Example II

Use has been made of four points of which the distance diagonally between points was 1 meter; the voltage supplied was 60,000 volts. The apparatus was arranged in the proximity of a set of four vertical kilns employed for the manufacture of hydraulic lime; these kilns were loaded during 8 hours by day; the distance from the apparatus to each of the kilns was about 3 to 60 meters according to the position of the carious kilns. Two months after the setting in operation of the apparatus, for a charge of 626, 634 kg of lime ore and 79, 945 kg of coal (calorific value 4460 calories) we have extracted from the kilns 447, 091 kg of lime which corresponds to a rate of 790 calories per kilogram of unslaked lime obtained instead of the usual rate of 1200 calories for the same quantity of lime.

Example III

Similar results have been obtained in laboratory experiments during tests relating to the reduction of ores, such as ores of iron, aluminum… by making one of the four points of which the distance from the apparatus to the laboratory kilns varies from 3 to 50 meters and the voltage applies being 160,000 volts.

---

http://v3.espacenet.com/results?sf=a&DB=EPODOC&PGS=10&CY=ep&LG=en&ST=advanced&IN=Sprink+Leon

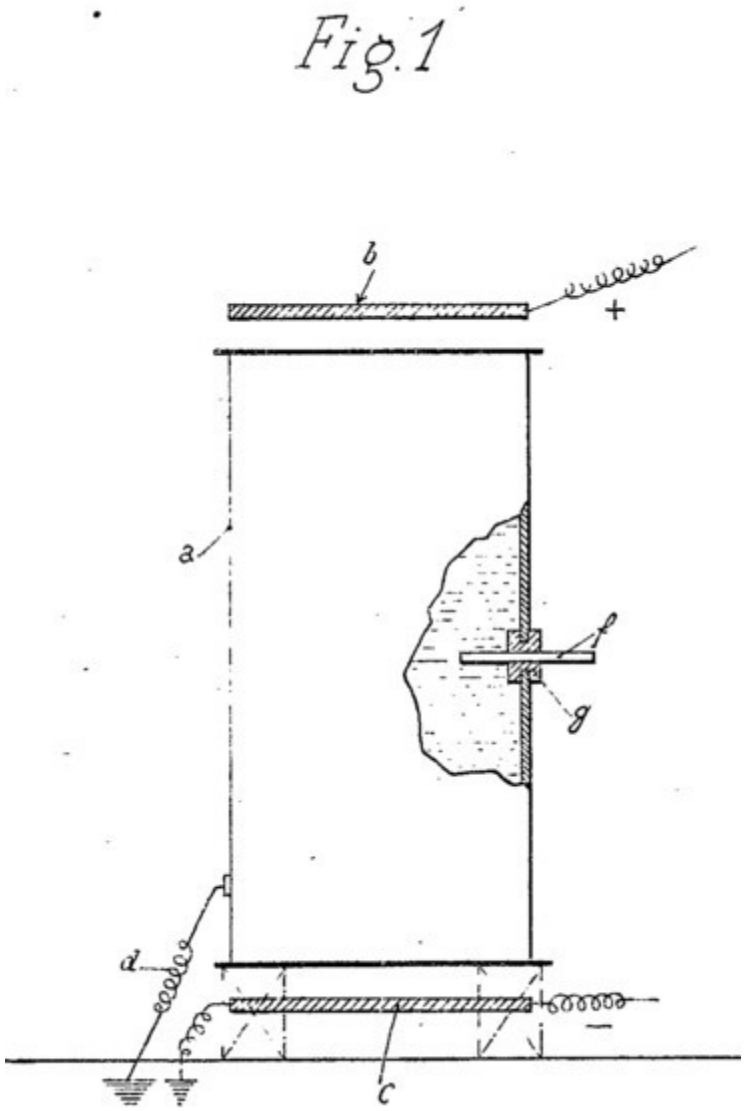
Patents

GB685522
Method of and Apparatus for Carrying out Chemical Reactions

Abstract --- The zone in which chemical reactions are carried out, under conditions of temperature and pressure normal to the reactions, is subjected to the influence of crossing fluxes produced in a place at right angles to the horizontal component of the earth's magnetic field, each of the fluxes being produced by a silent electric discharge across two opposing pointed electrodes having a potential diffierence of 1,000 to 160,000 volts derived from a source of direct current, the reactants being outside the paths of the fluxes. Examples relate to the saponification of tri-stearic with super-heated steam, the production of cement and the reduction of iron and aluminium ores, the reactions in each case being carried out in reactors which, according to their position, are 3 to 60 metres from the apparatus producing the fluxes, such apparatus having been in operation for 20 days before the reactions are commenced. ALSO: Cement is produced under normal conditions in kilns which are subjected to the influence of crossing fluxes produced in a plane at right angles to the horizontal component of the earth's magnetic field, each of the fluxes being produced by silent electric discharges between two opposing pointed electrodes having a

potential difference of 1,000-160,000 volts derived from a source of direct current, the cement kilns being outside the paths of the fluxes. The apparatus for producing the fluxes is operated continuously for twenty days before cement making is commenced, the reaction time then being reduced from 2 1/2 hours to one hour.

FR866491
(1941-08-14)
Dispositif pour améliorer les réactions chimiques



FR762697
(1934-04-16)
Procédé et dispositifs pour la transformation d'un liquide en vapeur et réciproquement

Fig. 1

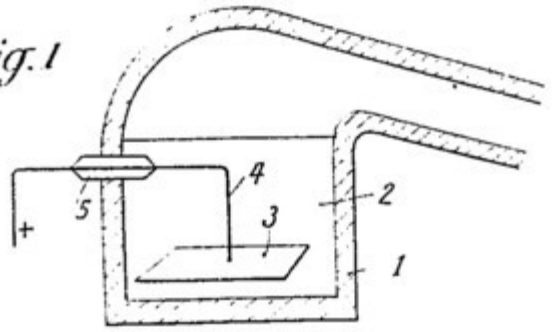
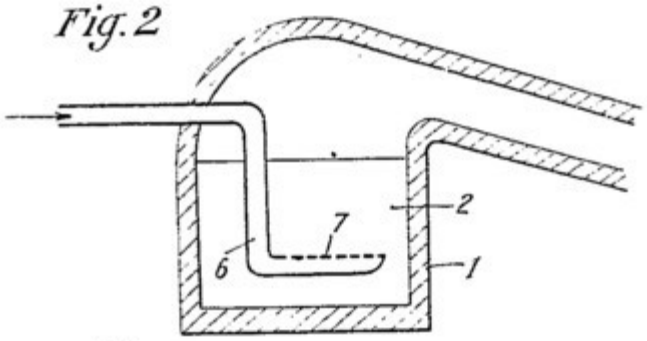


Fig. 2



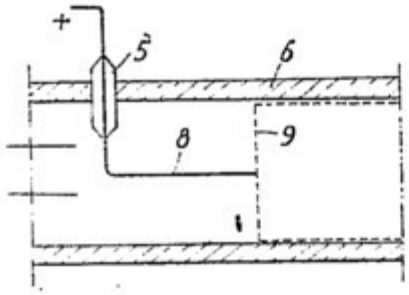


Fig. 3

Fig. 4

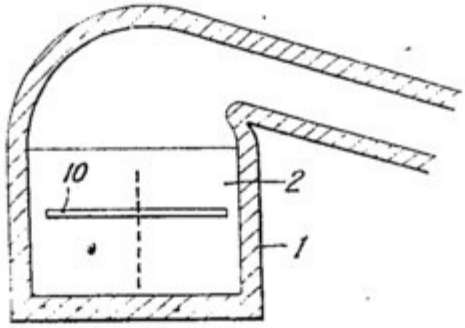


Fig. 5

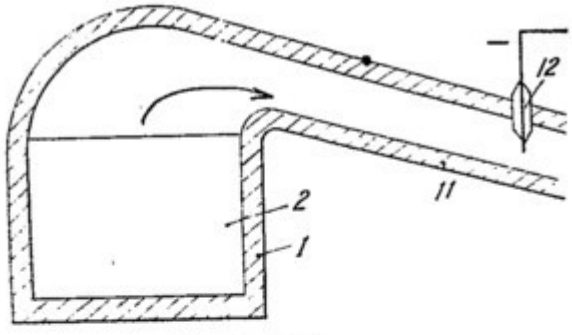
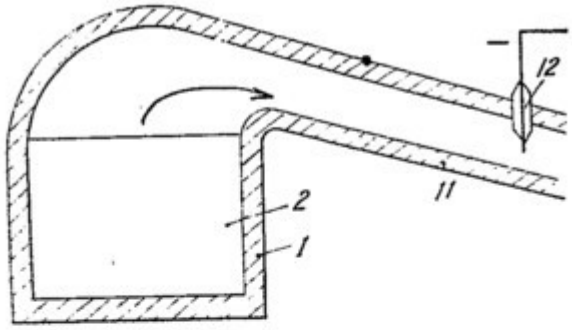


Fig. 5



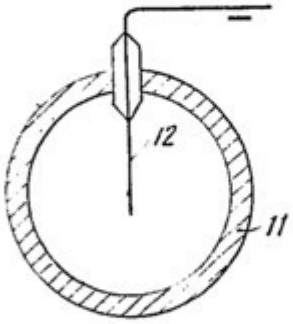
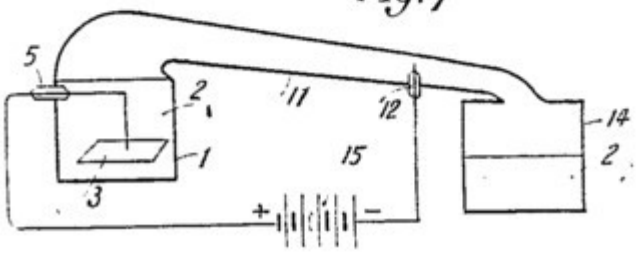


Fig. 6

Fig. 7



FR966735
(1950-10-17)
Procédé et appareils destinés à exercer une influence sur les modifications d'état de la matière

FR1005532
(1952-04-11)
Dispositif pour l'amélioration de certaines réactions chimiques

FI25576
(1952-02-11)
Vorrichtung zur Durchfuehrung von Reaktionen und Zustandsaenderungen der Materie Anordning varmed man inverkar på reaktioner eller ändringar i ett ämnes tillstånd

GR11802
(1948-09-28)
No title available

See also:--

http://v3.espacenet.com/textdoc?DB=EPODOC&IDX=WO8000293&F=0

WO8000293 // FR2421531

Apparatus for Amplifying Emissions Due to Shapes

Jacques RAVATIN

1979-10-26
Classification: - international: A01G7/04; A61N1/16; H05F7/00; A01G7/04; A61N1/00; H05F7/00; (IPC1-7): H05C3/00; - European: A61N1/16
Also published as: WO8000293 (A1) // EP0016079 (A1) // EP0016079 (A0)

Abstract --- The apparatus comprises a polygonal frame with sixteen sides (1 to 16), this frame being associated with four electrodes (19 to 22) allowing to generate inside the frame a very high electric field. After a starting time of about half an hour, effects on certain physical parameters considered to be invaluable for a given location occur within a radius of several tens of meters around the apparatus: action on the earth magnetic field, the gravitation, the air refraction index, the speed of plant growth, etc..

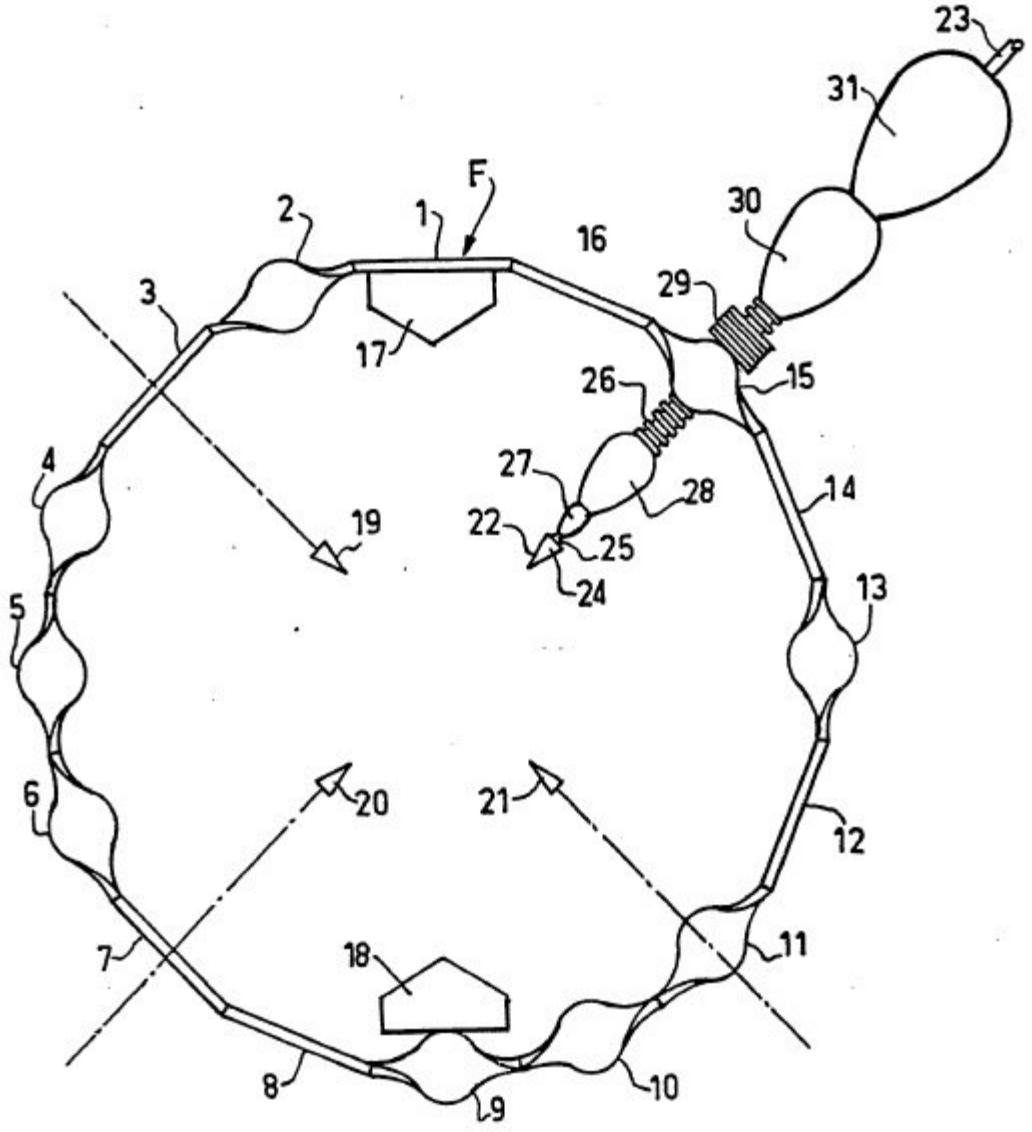

23
31
F
30
2
1
16
3
29
17
26
15
27
4
28
14
19
22
25
24
5
13
6
20
21
12
7
18
11
8
9
10

FIG.1

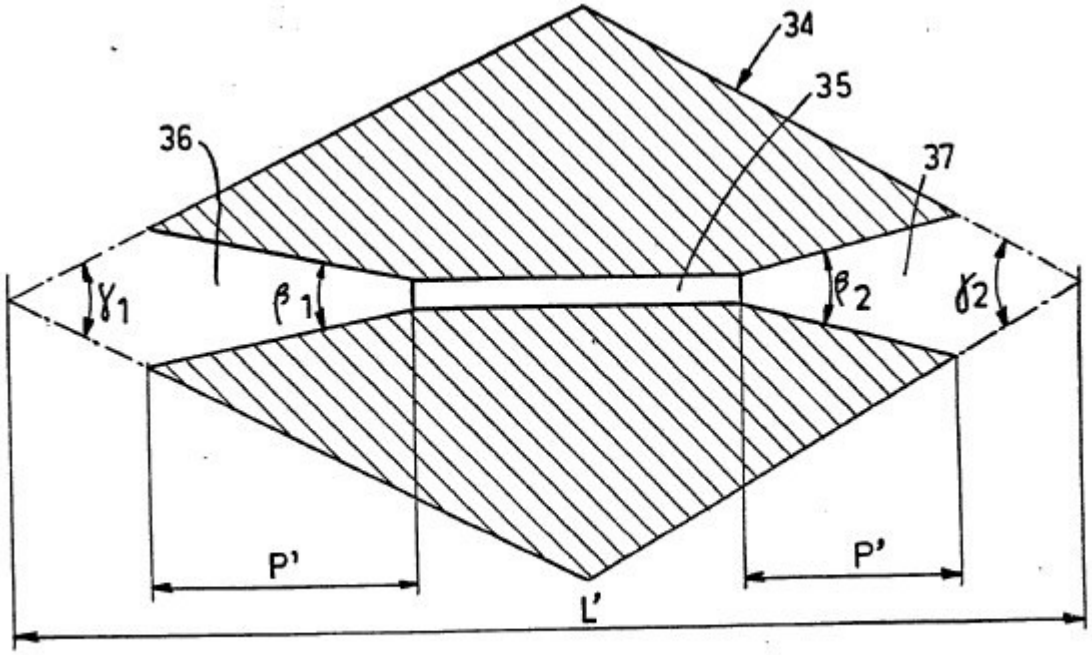


FIG.3

BUREAU
OMPI

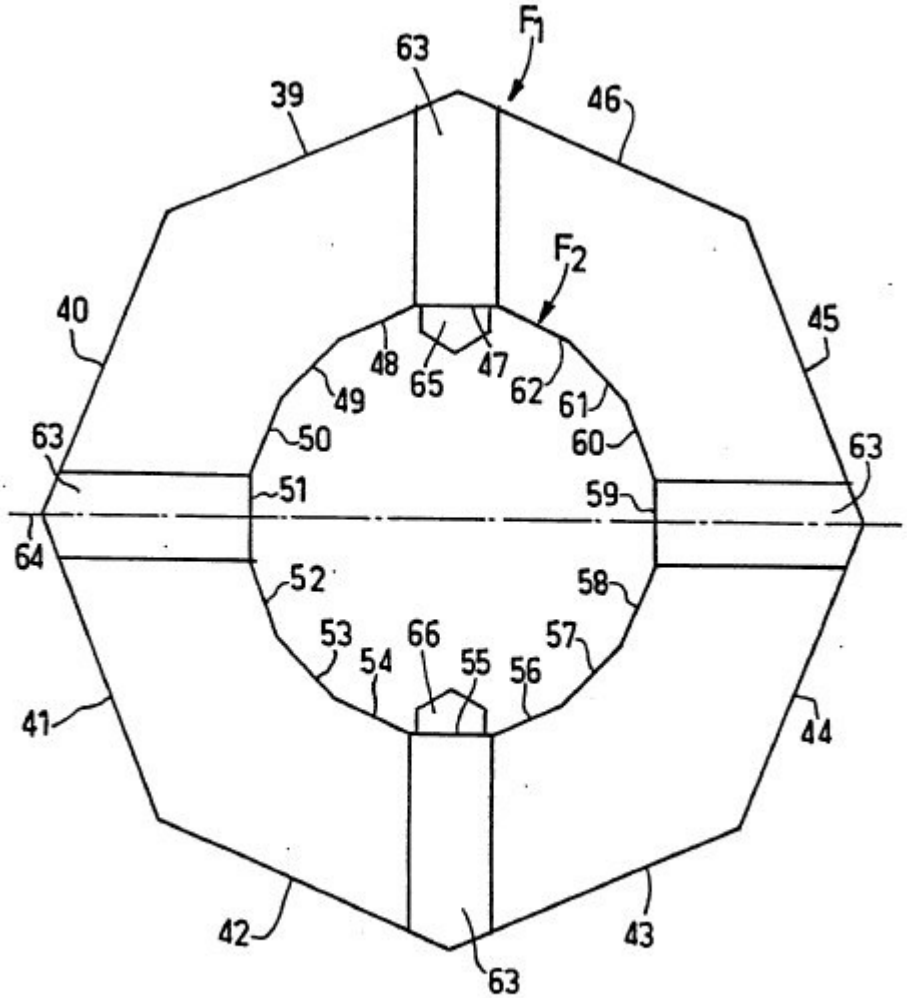


FIG.4

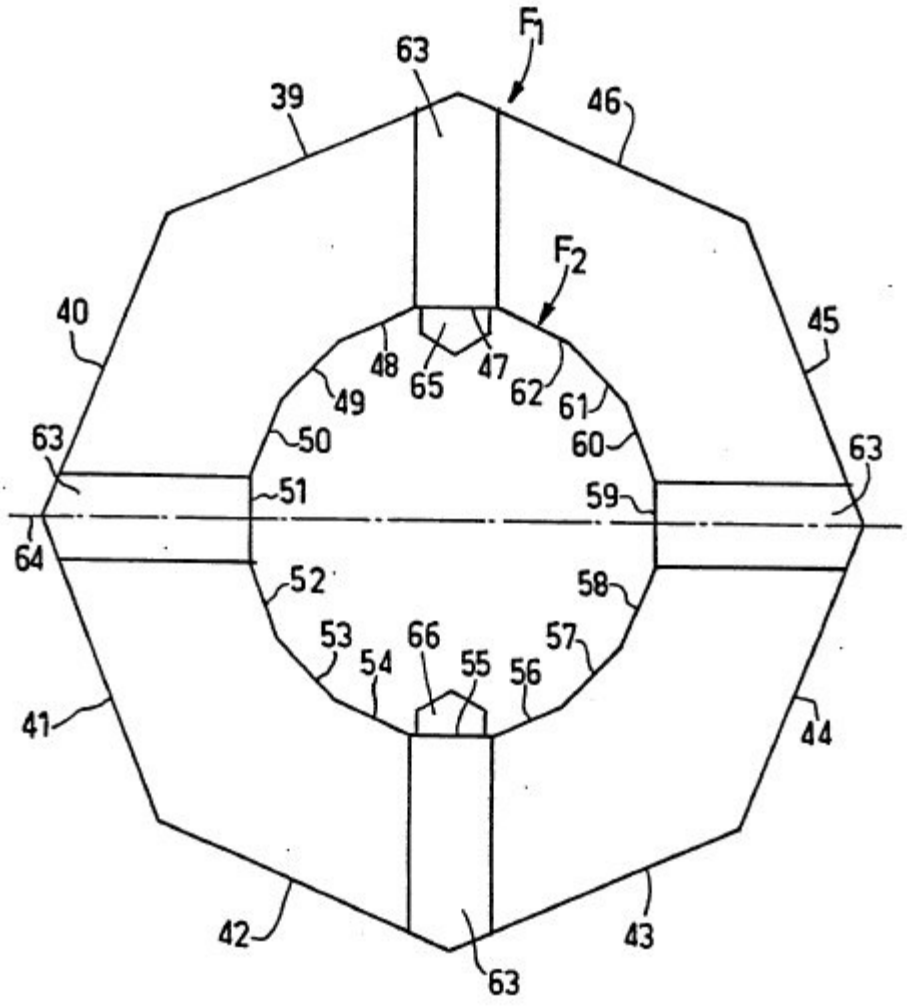
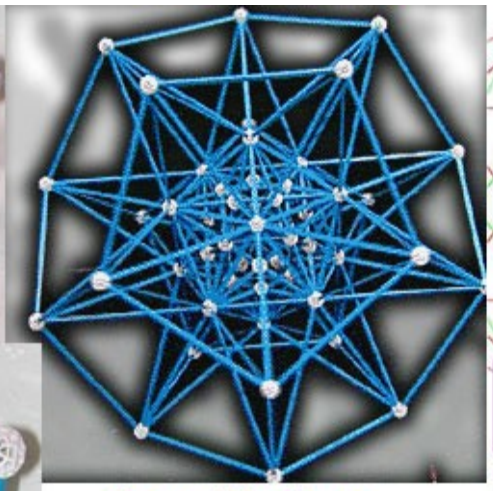
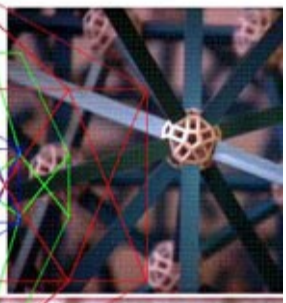


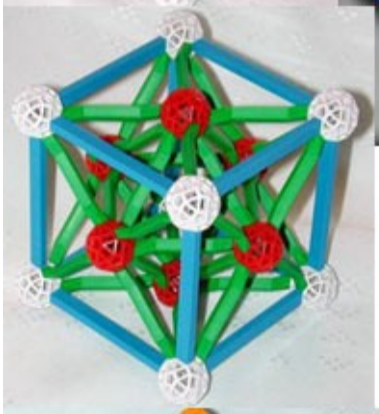
FIG. 4

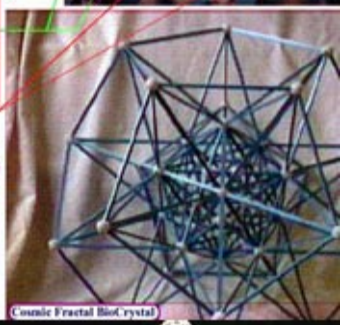
---

http://www.goldenmean.info/kit/
http://www.zometool.com/









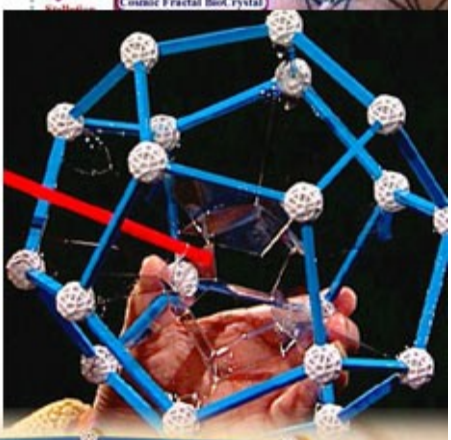
Star Mother

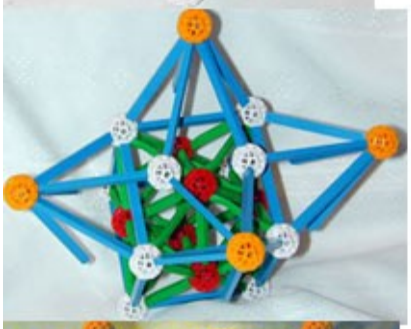
Sacred Geometry Modeling Kit

286 'Zome' Pieces
Symmetry for

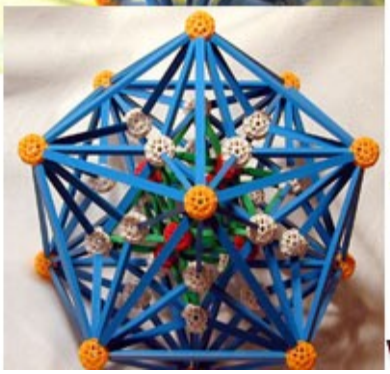
Implosion /
Fusion /
al KHEM y

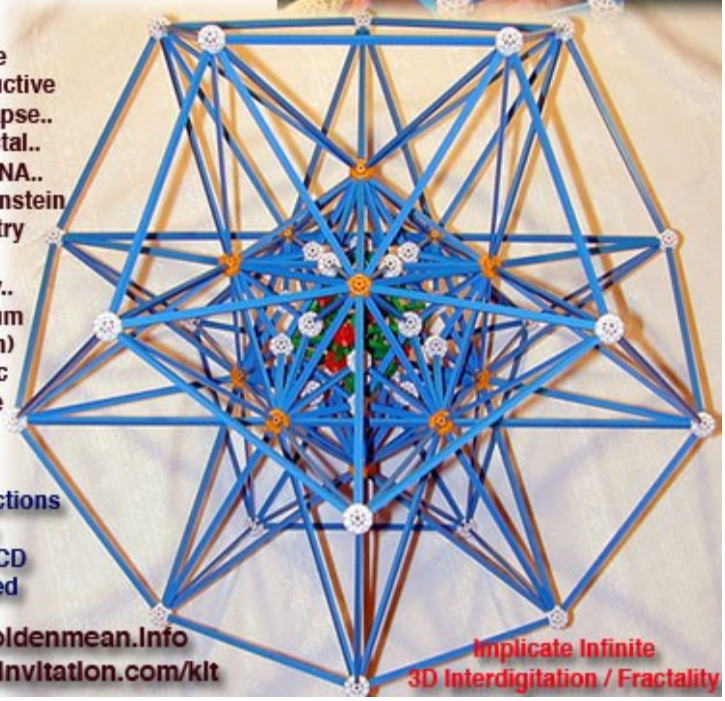
Star-Tetra (Green)
Octa (Red)
Cube (Blue)
Dodeca (White)
Icosa (Yellow)
Dodeca (White)





infinite
non-destructive
wave collapse..
a 3D Fractal..
Grail In DNA..
Poincare/Einstein
Symmetry
for
Gravity..
Palladium
(Fusion)
Atomic
Shape

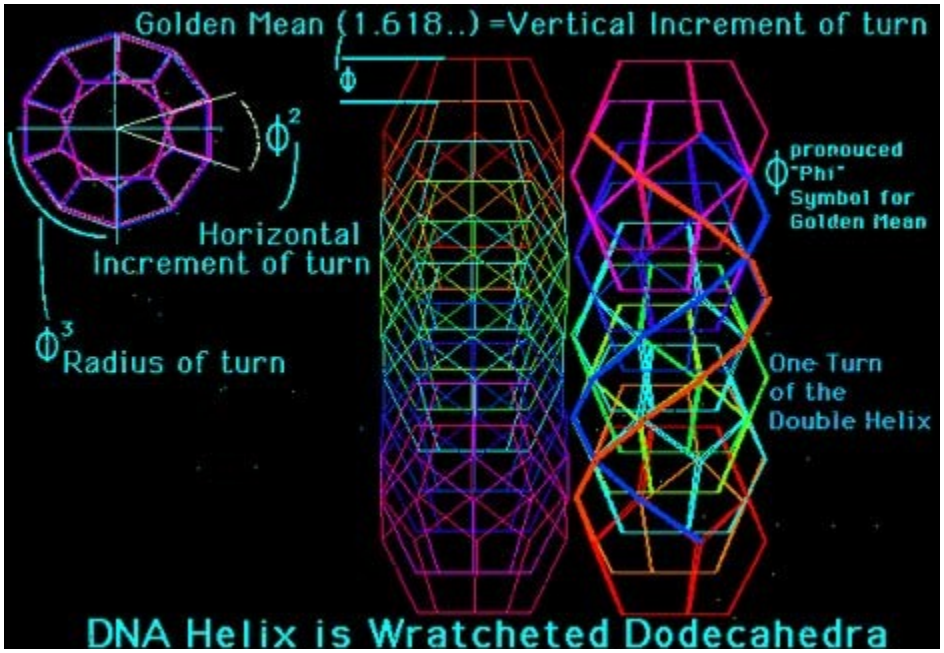




Full Instructions
with
VIDEO CD
Included

www.goldenmean.info
www.soulInvitation.com/kit

Implicate Infinite
3D Interdigitation / Fractality



&c...

V. ROSCHIN & S. GODIN

Magneto-Gravitational Converter (Searl Effect Generator)

V. Roschin & S. Godin: Experimental Research of Magnetic-Gravity Effects

V. Roschin & S. Godin: *Technical Physics Letters* 26 (12): 1105-1107 (2000) ~ "An Experimental Investigation..."

M. Pitkanen: About Strange Effects Related to Rotating Magnetic Systems

V. Roschin & S. Godin: Russian Patent # 2,155,435 ~ "Mechanical Energy Generating Device & Process"

V. Roschin & S. Godin: US Patent # 6,822,361 ~ "Orbiting Multi-Rotor Homopolar System"

Experimental Research of the Magnetic-Gravity Effects

by **V. V. Roschin** (rochtchin@mail.ru) & **S. M. Godin** (serjio@glasnet.ru)
Institute for High Temperatures, Russian Academy of Science, Izhorskaya 13/19, Moscow 127412, Russia
[This file is reproduced by courtesy of Alex Frolov: http://alexfrolov.narod.ru]

Abstract ~

In the present paper the results of the experimental research of Magnetic-Gravity Effects are presented. The abnormal magnetic and thermal changes in the radius of 15 meters from the researched device were measured as well. PACS: 41.20.-q; 44.60.+k; 76.50.+q

Introduction ~

There has been a great interest in examining nonlinear effects in the system of rotating magnetic fields. Such effects have been observed in the device called Searl's generator or SEG (SEG, Searl Effect Generator) [1-4]. An SEG consists of a series of three rings and rollers that go around those rings. All parts of SEG are based on the Law of the Squares. The rollers revolve around the plates that form the rings, but they do not touch them. There's a primary north and south pole on the rollers and a primary north and south pole on the plates. Obviously you will have the north pole of the roller attracted to the south pole of the plate. The plate and the rollers have layered structure. The external layer - Titan, then Iron, Nylon and last internal layer was made from Neodymium. John R.R. Searl has supposed that the electrons are given off from the central element (which is neodymium), and they travel out through other elements. If nylon had not been put there, the SEG would act like a laser and one pulse would go out and it would stop, build up, and another pulse would go out. But, with the nylon being, nylon acts as a control gate, and that control gate gives you an even flow of electrons throughout the SEG [4]. In [4] it was shown that in the process of magnetization of the plate and rollers, the combination of constant and variable magnetic fields for creating a special wave (sine wave) pattern on a plate surface and rollers surface was used. The basic effects are the rollers selfrunning around a ring plate and reduction of weight up to occurrence of propulsion and flying up of all magnetic system. These effects come about because of a special geometry of experimental setup. It was shown that the work of the device in critical regime is accompanied by biological and real physical phenomena.

Unfortunately except for the listed references we could not find other information where similar effects are be mentioned. In this paper we present the experimental device the results we have obtained.

The Description of the Experimental Installation ~

The basic difficulty is in a choosing the materials and maintaining the necessary pattern imprinting on the plate and rollers surfaces. To simplify the technology we decided to use a one-ring design with one-ring plate (stator) and one-ring of rollers (rotor). It is obvious, that it was necessary to strengthen the rollers on a rotor by the bearings and balance the rollers well. In the suggested design the air bearings were used which provided the minimum losses due to friction. From the available description [1-4] it was not clear how it is possible to make and magnetize the stator with a diameter of about one meter. In order to make the stator from separate magnetized segments executed on the basis of rare earth magnets with the residual induction 1T; the segments were magnetized in a usual way by discharging capacitor battery through the coil. Afterwards the segments were assembled and glued together in a special iron armature, which reduced magnetic energy. To manufacture the stator 110 KGs of rare earth magnets were used, and to manufacture the rotor 115 KGs of that material was used. High-frequency field under magnetization was not applied. It was decided to replace an imprinting technology described in [1-4] with cross-magnetic inserts having a flux vector directed at 90 degrees to a vector of basic magnetization of a stator and rollers of a rotor. For these cross inserts the modified rare earth magnets with a residual magnetization of 1,2 T and coercive force a little bit greater than in a base material was used. In Figure 1 and Figure 2 the joint arrangement of stator 1, elements of a rotor - rollers 2 and a way of their mutual gearing by means of cross magnetic inserts 19, are shown. Between the stator and roller surfaces the air gap *d* of 1 mm is left.

No layered structure was used except a continuous copper foil of 0.8 mm thickness which wrapped up the stator and rollers. This foil has the direct electrical contact to magnets of a stator and rollers. Distance between inserts in the rollers is equal to distance between inserts on the stator.

Figure 1: Variant of One-Ring Converter ~

The ratio of parameters of the stator 1 and the rotor 2 in Figure 2 is chosen so that the relation of stator diameter D and roller diameter d is an integer equal to or greater then 12. Choosing such a ratio allows us to achieve a magnetic spin wave resonant mode between elements of a working body of the device.

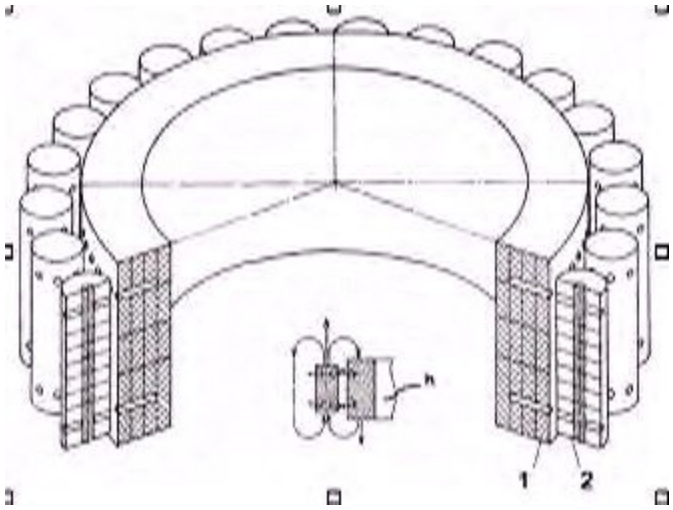


Figure 2: Organization of Magnetic Gearing Stator & Rollers ~

The elements of magnetic system were assembled in a uniform design on the aluminium platform. In Figure 3 the general view of the platform with one-ring converter is displayed. This platform was supplied with springs, amortizators and had a possibility of moving vertical on three supports. The value of displacement was measured by the induction meter of displacement 14; thus the change of the platform weight at once has been defined during the experiment in real time. Gross weight of the platform with magnetic system in the initial condition was 350 KGs.

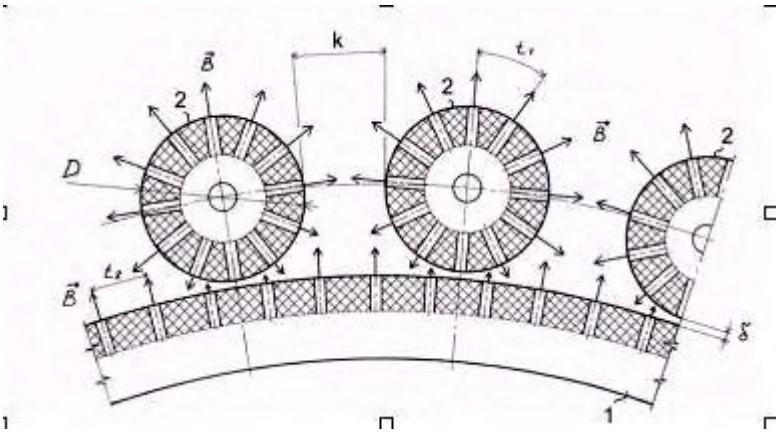


Figure 3: General View of the Platform with One-Ring Converter ~

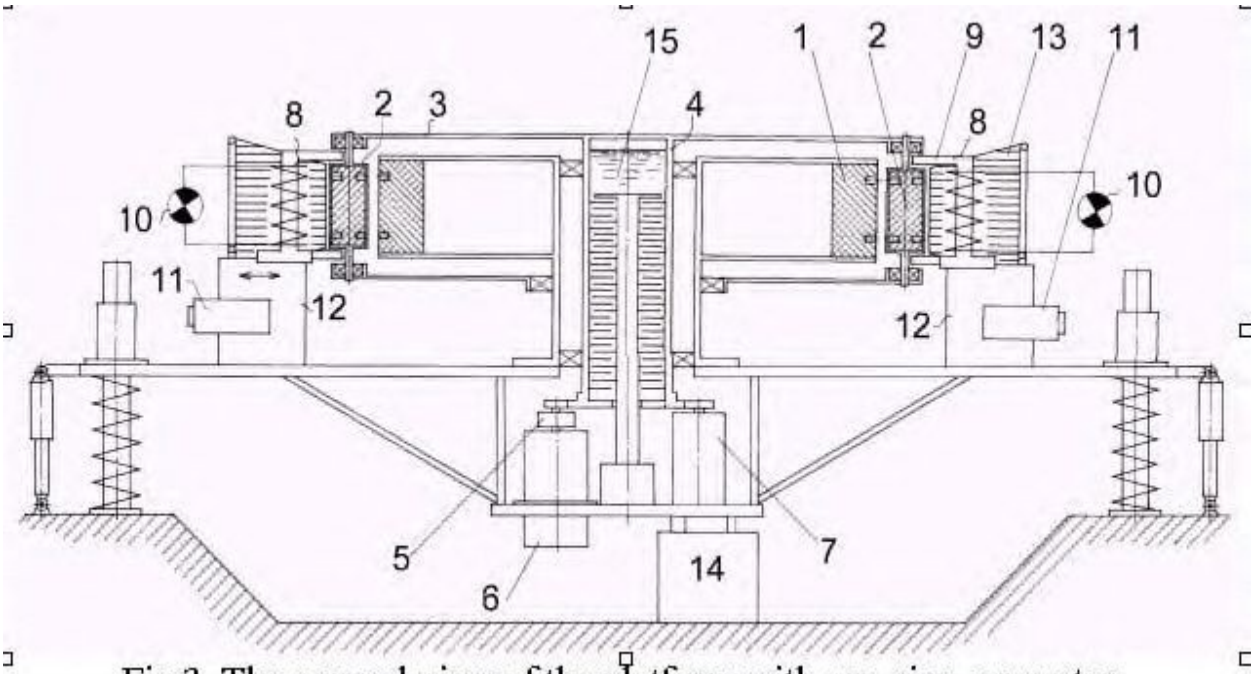


Fig.3. The general view of the platform with one-ring converter.

The stator 1 was mounted motionlessly, and the rollers 2 were assembled on a mobile common separator 3, connected with the basic shaft 4 of the device. Through this shaft the rotary moment was transferred. The basic shaft by the means of friction muff 5 was connected to the electrodynamics generator 7 and starting engine 6, which accelerated the converter up to a mode of self-sustained rotation. Along a rotor the electromagnetic inductors 8 with open cores 9 were located. The magnetic rollers 2 crossed the open cores of inductors and closed the magnetic flux through electromagnetic inductors 8, and induced emf in them, which acted directly on an active load 10 (a set of incandescent lamps with total power 1 kW). The electromagnetic inductors 8 were equipped with an electrical drive 11 and had an opportunity to smoothly move on supports 12. To study the influence of the external high voltage on the characteristics of the converter the system of radial electrical polarization was mounted. On periphery of the rotor ring electrodes 13 were set between the electromagnetic inductors 8 having with the rollers 2 air gap of 10 mm. The electrodes are connected to a high-voltage source; the positive potential was connected to the stator, and the negative to the polarization electrodes. The voltage was adjusted in a range of 0-20 kV. In experiments the constant value of 20 kV was used. In case of emergency braking, friction disk from the ordinary car braking system was mounted on a basic shaft of the rotor. The electrodynamics generator 7 was connected to active load through a set of switches ensuring step connection of the load from 1 kW to 10 kW. The converter under going testing had in its inner structure the oil friction generator of thermal energy 15, intended for taping a superfluous power (more than 10 kW) into the thermo-exchange contour. But since the real output power of the converter in experiment has not exceeded 7 kW, the oil friction thermal generator was not used. The complete stabilization of revolutions of the rotor was carried out by electromagnetic inductors connected to an additional load, which was set of incandescent lamps with total power 1 kW.

Experimental Results ~

The magnetic-gravity converter was built in a laboratory room on three concrete supports at a ground level. The ceiling height the lab room was 3 meters. Besides the presence of the iron-concrete ceiling, in immediate proximity from the magnetic system there was a generator and electric motor, which contained some tens KGs of iron and could potentially deform the field's pattern. The device was started by the electric motor, which accelerated the rotation of the rotor. The revolutions were smoothly increased up to the moment the ammeter included in a circuit of the electric motor started to show zero or lower value of a consumed current or even a presence of the back current. The presence of the back current is detected at approx. 550 rpm. The magnetic moving sensor 14 starts to detect the change in weight of the whole installation at 200 rpm. Afterwards the electric motor is completely disconnected by the electromagnetic muff and the ordinary electrodynamics generator is connected to the basic shaft of the device through the same muff. The rotor of the converter continues to self-accelerate and with the approach to the critical mode of 550 rpm, the weight of the device quickly changes. In addition to the change speed of rotation the weight depend of the power, removed into active load, (the set of ten ordinary electrical water heaters of 1 kW was used) and of the applied polarizing voltage, as well. At the maximum output power equal to 6-7 kW the change of weight G of the whole platform (total weight is about 350 KGs), reaches 35 % of the weight in an initial condition G?. A load of more than 7 kW results in a gradual decrease of revolutions and exit from the mode of self-generation with the subsequent complete stop of the rotor. The weight of a platform can be controlled by applying of a high voltage to cellular ring electrodes located at a distance of 10 mm from external surfaces of the rollers. Under the high 20 kV voltage (electrodes negative pole) the increase of taped power in circuit of the basic generator more than 6 kW does not influence G while the revolutions per min is not decreased to 400 rpm. "Tightening" of this effect is observed as well as the effect of hysteresis on G (a kind of "residual induction"). The experimental diagrams given on Fig.4 illustrate the modes of the converter operations.

Figure 4: Modes of Operation of the Magnet-Gravity Converter ~

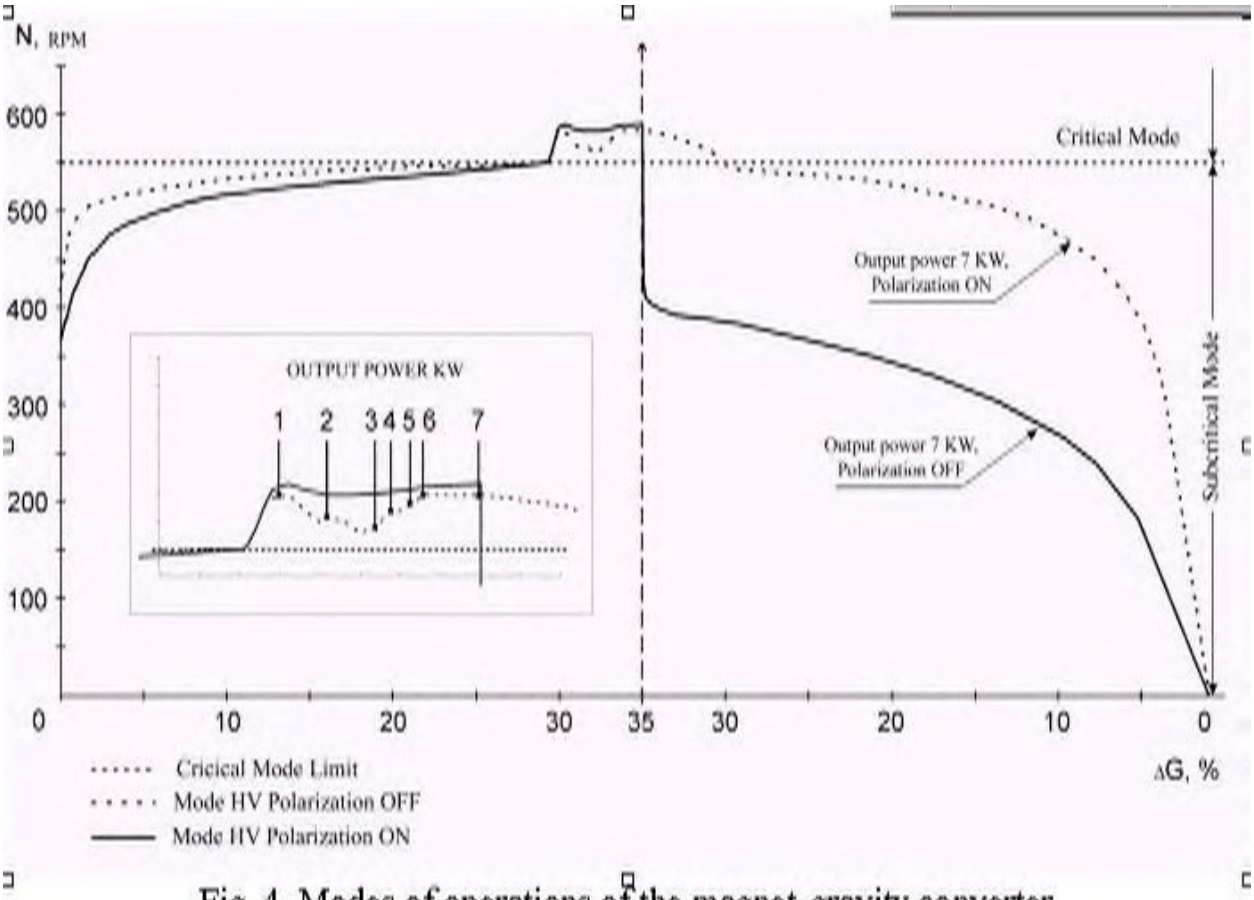


Fig. 4. Modes of operations of the magnet-gravity converter.

The effect of a local change of the platform weight is convertible relative to the direction of rotor turning, and has the same hysteresis. At clockwise rotation the critical mode comes in the area of 550 rpm and the propulsion force against the direction of gravitation vector is created, by analogy, at counter-clockwise rotation the critical mode comes the in area of 600 rpm and the propulsion on the direction of gravitation vector is created. The difference in approach to a critical mode of 50-60 rpm was observed. It is necessary to mention that the most interesting region lies above the critical area of 550 rpm, but due to of a number of circumstances the implementation of such research was not possible. Other interesting effects include the work of the converter in the dark room when corona discharges are observed around the converter's rotor as a blue-pink glowing luminescence and a characteristic ozone smell. The cloud of ionization covers the area of a stator and a rotor and has accordingly toroidal form. On the background of luminescence glowing on rollers' surfaces we distinguished wave picture. A number of more vigorous strips of discharges around the rollers were observed. These discharges were of the white - yellow colour is, but the characteristic for the arc discharges sound was not audible. One more effect previously not mentioned was observed i.e. the vertical magnetic "walls" around the installation. We noticed and measured the abnormal permanent magnetic field around the converter in the radius of 15 meters. The zones of an increased intensity of a magnetic flux 0,05T located concentrically from the centre of the installation were detected. The direction of magnetic field vector in these walls coincided with the direction of rollers' field vector. The structure of these zones reminded circles on water from the thrown stone. Between these zones a portable magnetometer, which used the Hall's sensor as a sensitive element, did not register

abnormal magnetic fields. The layers of an increased intensity are distributed practically without losses up to a distance of about 15 meters from the centre of the converter and quickly decrease at the border of this zone. The thickness of each layer is about 5 - 8 cm. The border of each layer has sharp shape, the distance between layers is about 50 - 60 cm and it slightly accrues when moving from the centre of the converter. The steady picture of this field was observed as well at a height of 6 m above the installation (on the second floor above the lab.). Above the second floor the measurements were not carried out. The abnormal fall of the temperature in direct affinity from the converter was also found. While the common temperature background in laboratory was + 22? (2?) the fall of temperature equal to 6-8? was noticed. The same phenomenon was observed in vertical magnetic walls as well as. The measurements of temperature inside the magnetic walls were carried out by the ordinary alcohol thermometer with inertia of indication about 1,5 min. In the magnetic walls the temperature changes can be distinctly observed even by hand. The hand when placed into this magnetic wall feels real cold at once. The similar picture was observed at the height above installation, i.e. on the second floor of the laboratory as well as despite the ferro-concrete blocking of ceiling.

Discussion ~

All the results we obtained are extremely unusual and require some theoretical explanation. Unfortunately the interpretation of results within the framework of the conventional physical theory cannot explain all the observed phenomena and first of all the change of weight. The change of weight is possible to interpret as a local change of gravity force or as an occurrence of propulsion force by repelling from its own field.

Direct experiment, confirming a presence of draft force was not performed, but in any case both interpretations of the weight change do not correspond to the modern physical paradigm and demand reconsideration of the standard theory of gravitation or criticism of the second law of Newton, both of which are only possible if we take into consideration the now-advert physical media ether as understood by Faraday-Maxwell-Mie. From the modern physics position electrization and luminescence of the converter's magnetic system in the near zone is not completely clear. The phenomenon of the magnetic and thermal "walls" may be connected with Alphen's magnetic-sound waves raised in near zone in magnetized plasma induced by a variable magnetic field of a rotating rotor [5].

At the present time we can not give an exact description of the interactions mechanism with environment and transformation of energy, but it is completely obvious, that without the use of the concept of physical media --- the ether in a sense of Faraday-Maxwell-Mie we are completely unable to give physically substantial theory of these phenomena. In conclusion, we emphasize that the issues of the biological influence effects and especially of the variations of real time stream effects, which must be taking place in an operative zone of the converter, were not considered at all. These issues are extremely important and absolutely unexplored; though there are some mentions of J.R.R.Searl about healing action of the SEG's radiation. Our own experience allows to make only cautious assumption that the short-term stay (dozen minutes) in a working zone of the converter with the fixed output power of 6 kW remains for the people without observed consequences. The present paper is only a beginning.

References ~

1. Herbert Schneider, Dr. J.B. Koeppl, Hans-Joachim Ehlers: "Begegnung mit John R.R. Searl"; *Raum und Zeit*, #39 (1989), pp. 75-80.
2. S. Gunnar Sandberg: "Was ist Dran am Searl-Effect; *Raum und Zeit*, #40 (1989), pp. 67-75.
3. Herbert Schneider & Harry Watt: "Dem Searl-Effect auf der Spur"; *Raum und Zeit*, # 42

(1989), pp.75-81; #43, pp.73-77.
4. John A. Thomas, Jr.: "Anti-Gravity: The Dream Made Reality"; *Extraordinary Science*, VI (2) 1994.
5. L.D.Landau, E.M.Lifshits: *Electrodynamics of Continuous Media*; Moscow, Nauka, 1982. (in Russian)

Technical Physics Letters 26 (12): 1105-1107 (2000)

"An Experimental Investigation of the Physical Effects in a Dynamic Magnetic System"

V.V. Roschin & S.M. Godin
Inst. of High Temperatures, Russian Academy of Sciences, Moscow, Russia

Abstract ~

It is demonstrated that a magnetic system based on rare-earth magnets is capable of converting various forms of the energy, provided that a certain critical operating regime is set up. As the critical regime is attained, the experimental setup becomes energetically fully autonomous. This is accompanied by local variations in the total structure weight, a decrease in the surrounding air temperature, and the formation of concentric "magnetic walls" at a distance of up to 15 meters from the experimental setup.

Introduction ~

We have experimentally studied the physical effects in a system based on rotating permanent magnets (1). Below we describe the technology of manufacture, assembly, and the results of testing this experimental setup, which is referred to as the converter.

Technological Description ~

The converter comprises an immobile stator and a rotor moving around the stator and carrying fixed magnetic rollers. The magnetic system of the working body of the converter has a diameter of about 1 meter. The stator and magnetic rollers were manufactured from separate magnetized segments made of rare-earth magnets (REMs) with a residual magnetization of 0.85 T, a coercive force of [Hc] ~ 600 kA/m, and a specific magnetic energy of [W] ~ 150 K/m3. The segments were magnetized by a conventional method based on a discharge of a capacitor bank through an inductor coil. Then the magnetized segments were assembled and glued together in a special mounting stage, which provided for the necessary tolerance in positioning the segments and for the removal of magnetic energy. Using this mounting stage, it was possible to glue the elements into the common unit. The stable incorporated REMs with a total weight of 110 kg and the rollers contained 115 kg of the same REM material.

The magnetic system elements were assembled into a single structure on a special platform made of non-magnetic structural alloys. The platform construction was provided with springs and shock absorbers and allowed the converter setup to move in the vertical direction on three sides. The motion was monitored by an inductive transducer. Which allowed changes ion the platform weight to be determined in the course of the experiment. The total weight of the platform with the magnetic system in the initial state was 350 kg.

Description of the Observed Effects ~

The converter was installed in a 2.5-meter high laboratory room using three concrete supports on a ground level. In addition to the ordinary steel-reinforced concrete ceiling blocks, the converter equipment featured a usual electrodynamic generator and an electric motor, with a total iron weight of several tens of kilograms (only these parts could, in principle, introduce distortions into the electromagnetic field pattern observed).

The converter was set to operate by over-speeding the rotor with the aid of the electric motor. The motor speed was gradually increased until the ammeter connected in the motor circuit showed zero consumed current and the current direction reversal. This state corresponded to a rotor speed of approximately 550 rpm, but the motion transducer began to indicate a change in the platform weight already at 200 rpm. Then the electric motor was disconnected using an electromagnetic overrunning clutch, and a usual electrodynamic generator was connected instead to the main shaft of the converter via another electromagnetic clutch. On attaining the critical regime (~550 rpm), the rotor exhibited a sharp increase in the rotation speed; this was accompanied by a slow-down in the rate of the current weight reduction. At this instant, the first 1 kW load was connected to the system. Immediately upon this connection, the rotation speed began to decrease, while the Delta G value kept increasing, and so on as depicted in the figure.

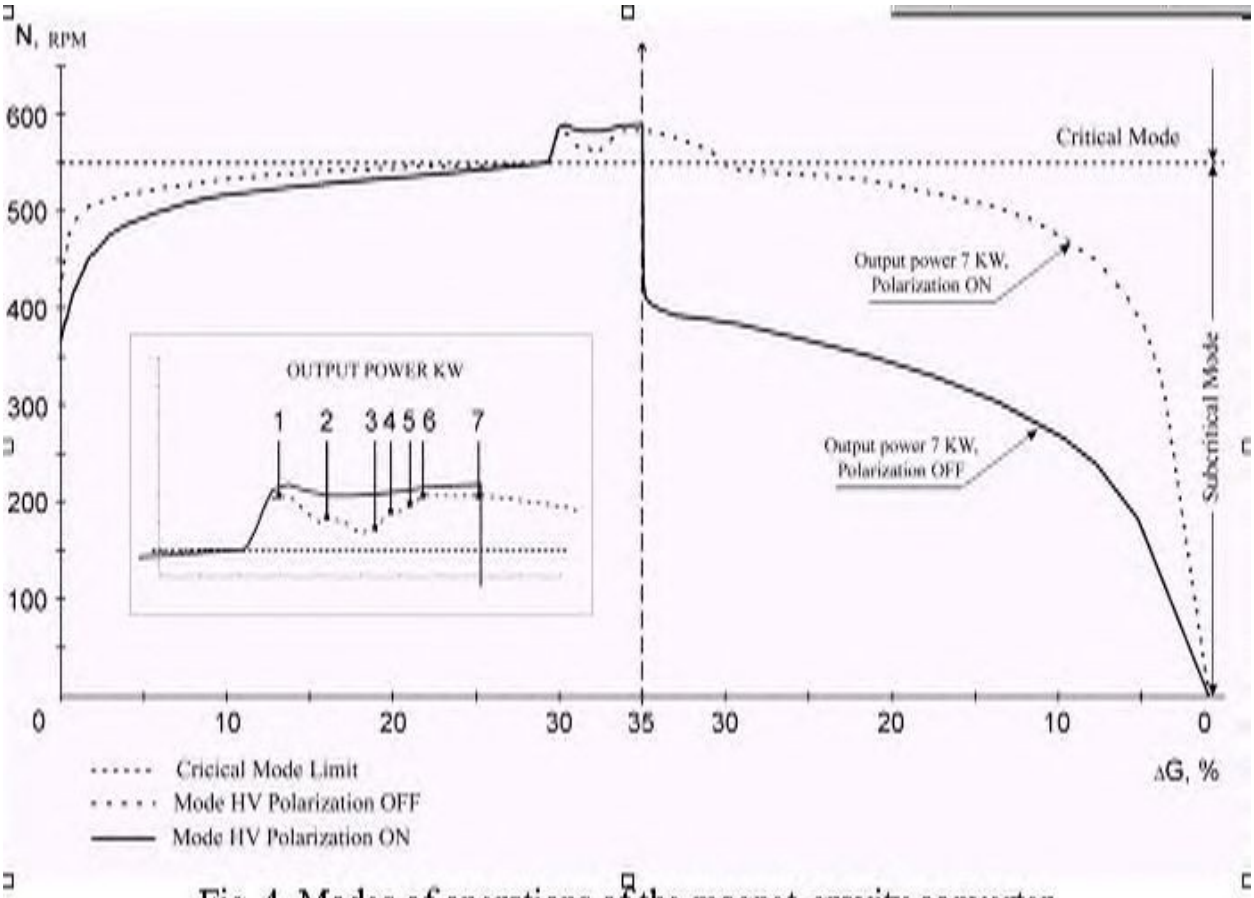


Fig. 4. Modes of operations of the magnet-gravity converter.

A diagram illustrating various operation regimes of the magnetogravitational converter showing (I) load power (kW) and system weight variation; (II) 7-kW load (high voltage off); (III) 7-kW load (high voltage on); (IV) supercritical regime; (V) subcritical regime (1, high voltage off; 2, high voltage on).

The system weight variation depend both on the power consumed by the active load (the load consisted of 10 ordinary 1-kW heating elements) and on the polarization voltage applied. For a maximum consumed power (7 kW), a change in the total platform weight reached 35% of the initial value in the immobile state (350 kg), which corresponded to 50% of the pure weight of the working body of the converter. An increase in the load power above 7 kW led to a gradual decrease in the rotor speed and, eventually, to the system going out of the self-generation regime and the rotor speed decreasing until the full stop. The platform weight could be controlled by applying a high-voltage signal to the cellular ring electrodes situated 10 mm above the external roller surface. Upon applying a 20 kV signal (negative polarity on the electrodes), an increase in the load power consumption above 6 kW did not affect the Delta G value even when the rotor speed decreased down to 400 rpm. This was equivalent to "prolongation" of the effect and was accompanied by phenomena of the remnant induction" type with respect to Delta G. The converter operation in various experimental regimes is illustrated in the figure.

The effect of the system weight variation is reversible with respect to the direction of rotor motion and exhibits certain hysteresis. For the clockwise rotation, the critical regime is observed in the region of 550 rpm and is accompanied by development of the force acting against the gravity vector. For the counter-clockwise rotation, the onset of the critical regime is observed at approximately 600 rpm and the extra force coincides in direction with the gravity vector. The onset of the critical regime exhibited a scatter within 50-60 rpm. It should be noted that, probably, some other critical resonance regimes may exist, which correspond to higher rotor speeds and markedly greater useful load levels. Proceeding from the general theoretical consideration, the output mechanical energy must nonlinearly depend on the internal parameters of the converter magnetic system and the rotor speed, so that the observed effects are likely to be far from optimum. Establishing of the maximum output power maximum weight variation, and the converter energy resource is of considerable theoretical and practical interest.

Besides the phenomena described above, a number of other interesting effects were observed in the system studied. In particular, the converter operation in the dark is accompanied by a corona discharge with a pink-blue light emission and by the production of ozone. The ionization cloud is formed around the stator and rotor, acquiring a toroidal shape. The general corona discharge background is superimposed with a wavy pattern corresponding to the surface of the rollers: the zones of increased emission intensity are distributed along the roller height in a manner similar to that observed for the high-voltage microwave induction energy storage in the pre-breakdown state. These zones appeared yellowish-white, but the emission was not accompanied by sounds characteristic of the arc discharge. Nor did we observe any visible erosive damage on the stator and rotor surfaces.

One more effect, which was never reported previously, is the appearance of vertical "magnetic walls" surrounding the setup. We have detected and measured an anomalous constant magnetic field around the converter. The measurements revealed zones of increased magnetic strength on the order of 0.05 T arranged coaxially relative to the system center. The direction of the magnetic field vector on the "walls" coincides with that in the rollers. The structure of these magnetic zones resembles the pattern of circular waves on the water surface. No anomalous field is detected by a mobile magnetometer, employing the Hall effect transducer, in the area between zones. The layers of increased magnetic field strength are propagating with virtually no attenuation to a distance of 15 meters from the converter center and then rapidly decayed at the boundary of this 15-meter area. Each layer zone is 5-8 cm thick and exhibits sharp boundaries. The layers are spaced by 50-60 cm, the spacing slightly increasing with the distance from the converter center. A stable pattern was also observed at a height of 5 meters above the setup (the

measurements were conducted in a 2nd floor room above the laboratory; no tests were conducted on a still higher level).

Another interesting phenomenon consists in an anomalous temperature drop in the immediate vicinity of the converter. At a general room temperature level in the laboratory (+22 +-2 C), the temperature at the converter surface was 6-8 C lower. Similar temperature variations were detected in the vertical magnetic "walls". The temperature changes in the walls were detected by an ordinary alcohol thermometer with a reading set time of 1.5 minutes. The temperature variations in the magnetic "walls" can even be sensed by the human body: a hand placed inside the "wall" immediately feels cold. The same pattern was observed at a height of 5 meters above the setup in a 2nd floor room above the laboratory (despite the steel-reinforced concrete blocks separating the rooms).

Discussion of Results ~

All the experimental results described above are very unusual and need some theoretical rationalization. Unfortunately, attempts at interpreting the obtained results within the framework of the existing physical theories showed that no one of these models can explain the whole set of experimental data.

Recently, Dyatlov (2) attempted to combine the concepts of electricity and gravity by introducing the so-called electronavigation and magnetic-spin coefficients into the Heaviside gravity equations and the Maxwell field equations. This provides for a relationship between the gravitational and electrical components, as well as between the magnetic and rotational components in a given medium. The assumptions are built around a special model of inhomogenous physical vacuum, called the vacuum domain model (2). It is suggested that the extra relationships are absent outside the vacuum domain. Although it is difficult to imagine a long-living vacuum domain, the proposed model provides for a satisfactory explanation (at least on a qualitative phenomenological level) for the appearance of emission, the system weight variations, and the conversion of energy taken from the surrounding medium into the rotational mechanical moment of the rollers. Unfortunately, the theory cannot provide a physical pattern of the observed phenomena.

Conclusion ~

At present, the work on a developed variant of the converter are in progress at the Glushko "NPE Energomash" company (Moscow). This setup would allow a deeper insight into the physics of observed phenomena. Another aim is the creation of commercial samples for various practical applications.

References ~

(1) Thomas, J.A.: *Anti-Gravity: The Dream Made Reality ~ The Story of John R.R. Searl*; Direct International Science Consortium, London, 1994), Vol. 1, Issue 2.
(2) Dyatlov, V.L.: *Polarization Model Heterogenous Physical Vacuum* (Inst. Mat., Novosibirsk, 1998); Translated by P. Pozdeev.

M. Pitkanen: About Strange Effects Related to Rotating Magnetic Systems ~ An explanation of the Roschin-Godin experiment in terms of Topological Geometro-Dynamics (TGD). [PDF: Requires Adobe Acrobat]

Roschin/Godin: Russian Patent # 2,155,435

Mechanical Energy Generating Device & Process

Publication date: 2000-08-27
Application Number: RU19990122275 19991027 ~ Priority Number(s): RU19990122275 19991027
IPC Classification: H02N11/00; F03H5/00

Abstract ~

Power engineering and transport; miscellaneous industries. UBSTANCE: Single-row power module has stator and rotor with rollers combined by common separator. Stator and rotor are made of permanent magnets or electromagnets based on composite laminated magnetic, conducting, and insulating materials. Main shaft of device is coupled via free-wheel clutches with starting motor that brings device to automatic speed-maintaining mode of operation and device loading system which is, essentially, electrodynamic generator mechanically coupled with main shaft of device. Electromagnetic transducers are radially arranged on device periphery. Propulsion control is effected by adjusting mechanical energy taken off the device and by producing radial electric polarization on its periphery by means of annular electrodes separated from rotor rollers by air gap. Electrodes are connected to high-voltage power supply. Generating process includes electric power supply to starting gear, acceleration of rotor shaft to working speed, take-off of generated energy, and adjustment of mentioned energy and propulsion by varying rotor and stator speed through varying load of generator connected to device as well as by adjusting high voltage applied from external power supply. EFFECT: Reduced energy consumption. 9 cl, 17 dwg.

US Patent # 6,822,361

US Cl. 310/178 ~ November 23, 2004

Orbiting Multi-Rotor Homopolar System

Roschin; Vladimir Vitalievich (Moscow, RU); **Godin; Sergi Mikhailovich** (Moscow, RU)

Abstract -- An orbiting multi-rotor homopolar machine employs axially parallel, cylindrical, electrically conductive magnets arranged circumferentially around vertical axis of central stator ring, intimately contacting and engaging non-slip rolling between rotor magnets and stator. A bearing rotatably secures each end of each magnet to a corresponding electrically conductive circular endplate, each slightly wider than the stator. An electrically conductive axle located in the center of the stator rigidly attaches to one of the top circular endplate, and an electrically insulating bearing means attaches the center of bottom circular endplate to a coaxial inner cylinder, located between the axle and the stator.

Assignee: Energy & Propulsion Systems LLC (Valencia, CA)

References Cited
U.S. Patent Documents:

406,068 ~ Jul., 1889 ~ Tesla ~ 310/178
645,943 ~ Mar., 1900 ~ Dalen, et al. ~ 310/178
3,185,877 ~ May., 1965 ~ Sears ~ 310/178
3,465,187 ~ Sep., 1969 ~ Breaux ~ 310/178
5,241,232 ~ Aug., 1993 ~ Reed ~ 310/178
5,278,470 ~ Jan., 1994 ~ Neag ~ 310/178

5,977,684 ~ Nov., 1999 ~ Lin ~ 310/178
6,051,905 ~ Apr., 2000 ~ Clark ~ 310/178
Foreign Patent Documents:
2,094,066 ~ Sep., 1982 ~ GB
2000-324,786 ~ Nov., 2000 ~ JP
2001-286,117 ~ Oct., 2001 ~ JP
2003-47,226 ~ Feb., 2004 ~ JP

Primary Examiner: Mullins; Burton ~ *Attorney, Agent or Firm:* Our Pal LLC

Description ~

FIELD OF THE INVENTION

This invention relates generally to the field of direct current electrical motors and generators that operate without the need for commutation and/or rectification, and more particularly to multi-rotor homopolar machines which derive their emf (electromotive force) from co-rotational magnets and metallic disk embodiment.

BACKGROUND

Back in 1831, Michael Faraday discovered that a cylindrical magnet suspended by a string and touching a mercury bath at the bottom could generate electricity while spinning along its axis if a second electrical contact was made at the periphery of the midpoint of the magnet. His experiment was a one-piece homopolar machine since the magnet and conductor were joined together. Such Faraday generators have also been called acyclic, unipolar or homopolar generators because no commutation or alternating of the magnetic poles is necessary for this machine in order to generate electricity.

The type of electrical output is most often direct current (DC) unless specific means are designed to provide an interruption of radial conduction and thus simulate alternating current (AC). Historically, DC was championed by Thomas Edison during the early part of the 20th century while at the same time AC was championed by Nikola Tesla and George Westinghouse. In the future, DC will be coming back into style with the emergence of ambient temperature superconductive cables. Therefore, highly efficient homopolar generators will be in demand to meet the future market demand for DC electricity.

Homopolar generators usually have a single disk or drum rotating in a stationary magnetic field with sliding contacts. The sliding contacts often present high resistance however. The construction and operation of homopolar machines for electric propulsion of marine vessels or railguns for example is already well known. Such machines include motors and generators wherein electrical current flows through a conductor situated in a magnetic field during rotation of the machine rotor.

In the case of a homopolar motor, the current will develop a J.times.B force perpendicular to the direction of its flow through the conductor and that of the magnetic field. In the case of a homopolar generator, a voltage dependent on the rotational speed, magnetic field, and radius, is induced in a conductor moving within the magnetic field. When current is drawn from the homopolar generator, it also develops a J.times.B force for the same reason as with the motor but is referred to as back torque or armature reaction. General reference information including basic principles used to reduce back torque can be found in The Homopolar Handbook by Thomas Valone (ISBN 0-9641070-1-5).

The prior art rarely includes a one-piece homopolar machines that rotate the magnet with the disk. Even more unknown is the concept of rolling contacts. Eliminating sliding contacts is shown in the "Planetary Homopolar Generator," IBM Technical Disklosure Bulletin, Vol. 17, No. 6, p. 1786-87, November, 1974, H. D. Varadarajan.

Using a conducting belt or rolling contacts to gather current from a magnetic field flux cutting rotor, there is an annular magnetic field through which the rotor executes a planetary motion.

The large stresses resulting from the centrifugal force of the massive, unbalanced planetary rotor is a distinct disadvantage, prohibiting high speed operation. Thus, only a low rate of rotation is possible with the IBM design.

The "Direct Current Homopolar Machine" U.S. Pat. No. 5,587,618 to Hathaway demonstrates an analogous concept of relative motion between conductive orbiting shaft and a stationary disk-shaped magnetized armature.

However, the design is a bit cumbersome to be practical. Science Applications International Corporation claims a conductive belt, dual disk "Homopolar Motor-Generator" in U.S. Pat. No. 5,241,232 to Reed that apparently reinvents the "Dynamo Electric Machine" of U.S. Pat. No. 406,968 patented by none other than Nikola Tesla in 1889 that also has two unipolar magnetized rotors connected by a conductive belt. The belted dual unipolar machines solve one of the problems that plague the field by offering two sliding contacts at the low speed surface on the axle. However, the present invention requires only one sliding contact on the axle. These conductive belt machines also demonstrate, in principle, the concept of a multi-rotor, planetary design, by the process of coordinate transformation, since relative motion is the key to the operation of a homopolar generator. The concept of rolling contact is demonstrated with the Dalen "Dynamo Electric Machine" U.S. Pat. No. 645,943, where two disks are turning in opposite directions while in contact with each other at their periphery. However, the axle of each disk must remain fixed in place whereas each axle is in orbiting motion in the present invention.

Homopolar machines can reversibly function as motors as well, such as flywheels, and used as energy storage devices. First used in transportation applications in the 1950's, flywheel powered buses were designed to have the flywheel accelerated at every stop. Composite rotors currently have been developed which can spin at very high revolutions (100,000 revolutions per second); and the speed is limited by the tensile strength of the rim of the rotor. By using a multi-rotor design, the centrifugal forces of a large disk can be greatly reduced and still maintain high-energy storage or production. By using magnetic bearings, the friction on the axis of the rotor can be reduced sufficiently so that such rotors can maintain most of the energy for several days.

The IBM Varadarajan planetary rotor is unbalanced and has a low rate of magnetic flux cutting due to its annular magnetic field design. The Hathaway direct current machine has a lot of unbalanced conductive material orbiting the central magnetized disk which limits the rotational speed.

The conductive belt designs can be subject to oxidation and slippage, even requiring a toothed timing belt on each axle as well. With most disk models of homopolar generators, as opposed to drum designs, sliding contacts are the single most important contribution of resistance inhibiting the power output of the machine. Internal resistance is the only limit to the output capability of a homopolar generator and it is important to reduce all sources of internal resistance to obtain maximum power output for a given input torque. Rather than use high resistance carbon brushes, medium resistance silver-graphite brushes or dangerous conductive liquids such as mercury, low temperature solder, or sodium-potassium, there is a need to eliminate frictional sliding contact at the high speed periphery of the magnetized rotor completely. Furthermore, rather than

maintaining two sliding contacts which contribute friction and resistance, even in the rolling and belted designs, there is a need to cut the number in half to only one high current sliding contact. The present invention satisfies both of these needs.

SUMMARY

The present invention derives direct current electricity by co-rotating a plurality of magnets and a metallic disk. It comprises an improved homopolar machine with dynamically balancing, axially parallel, cylindrical, electrically conductive magnets arranged circumferentially around the vertical axis of central stator ring. Such a design can be referred to as distributed generation since each magnet rotor generates only a fraction of the current that is transmitted through the machine. Thus, the conductive bearings contacting the center of each end of the magnet rotors may carry only one tenth or less of the total current.

The multi-rotor orbiting homopolar also does not include sliding contacts at each magnetized rotor rim but instead utilizes a suitable rolling means attached separately to magnets and also to the stator ring for intimately contacting and engaging non-slip rolling between magnets and stator as they orbit around the stator. The magnetized rotors maintain rotational synchronism and equal relative position to each other with a bearing means rotatably securing the top and bottom end of each magnet to a corresponding electrically conductive circular endplate.

The electrical energy is extracted, or input if used as a motor, through contacts on the conductive stator and at the machine's electrically conductive axle located in the center of the machine while rigidly attached to the top circular endplate that rotates with all of the individually magnetized rotors. The only single, high current, moving contact that is required is an electrically conductive thrust bearing that supports the central axle. An insulating thrust bearing meanwhile separates the axle from the center of bottom circular endplate. The stator, which is of course stationary, accomplishes the second contact means through a standard electrical connection with no need for any relative motion sliding contact. The stator may be optionally magnetized in the opposite direction to the magnetized rotors in order to increase the coercive force or magnetic flux density.

The drawings constitute a part of this specification and include exemplary embodiments to the invention, which may be embodied in various forms. It is to be understood that in some instances various aspects of the invention may be shown exaggerated or enlarged to facilitate an understanding of the invention.

The Problem ~

The problem this invention solves is that it generates high power direct current electricity without the need for commutation and rectification, otherwise the internal resistance losses are high.

The problems with prior art devices, processes and systems can be categorized as follows.

1. Require commutation or rectification to generate direct current electricity.

2. Rely on more than one current brush which often have high speed contact.

3. Do not distribute magnetic field power generation by multi-rotor orbiting magnets in homopolar machines or systems.

4. Internal resistance losses are usually high.

5. Neither efficient nor cost effective.

6. Neither simple nor practical for most applications.

Prior Art ~

A preliminary limited prior art search was not commissioned but the inventor is intimately familiar with the prior art. Following are typical examples of the prior art arranged in reverse chronological order for ready reference of the reader.

11) Non-Provisional Utility U.S. Pat. No. 6,051,905 issued to Richard Clark on Apr. 18, 2000 for "Homopolar Generator"

10) Non-Provisional Utility U.S. Pat. No. 5,977,684 presented to Ted Lin on Nov. 2, 1999 for "Rotating Machine Configurable as True DC Generator or Motor"

09) Non-Provisional Utility U.S. Pat. No. 5,864,198 earned by Joseph Pinkerton on Jan. 26, 1999 for "Brushless Generator"

08) Non-Provisional Utility U.S. Pat. No. 5,587,618 issued to George Hathaway on Dec. 24, 1996 for "Direct Current Homopolar Machine"

07) Non-Provisional Utility U.S. Pat. No. 5,278,470 graced upon Zacharias Neag on Jan. 11, 1994 for "Homopolar Machine which acts as a Direct Current (DC) High Voltage Generator or Motor"

06) Non-Provisional Utility U.S. Pat. No. 5,241,232 honorably given to Jay Reed on Aug. 31, 1993 for "Homopolar Motor-Generator"

05) Non-Provisional Utility U.S. Pat. No. 5,011,821 published in the name of Charley McCullough on Apr. 30, 1991 for "Method and Apparatus for Generating Electricity"

04) Non-Provisional Utility U.S. Pat. No. 3,465,187 issued to Onezime Breaux on Sep. 2, 1969 for "Homopolar Generator Having Parallel Positioned Faraday Disk Structures"

03) Non-Provisional Utility U.S. Pat. No. 3,185,877 presented to Anthony Sears on May 25, 1965 for "Direct Current Homopolar Generator"

02) Non-Provisional Utility U.S. Pat. No. 645,943 graced upon inventor Gustaf Dalen on Mar. 27, 1900 for "Dynamo Electric Machine"

01) Non-Provisional Utility U.S. Pat. No. 406,968 bestowed upon none other than Nikola Tesla himself in 1889 for "Dynamo Electric Machine"

None of the prior art devices known to the applicant or his attorney disclose the EXACT embodiment of this inventor that constitutes a simple, elegant and affordable system for an orbiting Multi-Rotor Homopolar direct current electricity generation

Objectives ~

Unfortunately none of the prior art devices singly or even in combination provide for all of the objectives as established by the inventor for this system as enumerated below.

1. It is an objective of this invention to provide devices, method and system for generation of high power direct current electricity without commutation and rectification.

2. The primary objective of the invention is orbiting multi-rotor cylindrical magnets in rolling contact that eliminates friction while generating DC electricity.

3. Another objective of the invention is to provide high efficiency, low noise and low resistance in a high current generator.

4. Another objective of the invention is that it uses readily available materials in a dynamically balanced arrangement.

5. Another objective of the invention is safety through reduced internal stress than comparable homopolar machines with a single rotor.

6. Another objective of the invention is that it provides distributed generation around an air core.

7. Another objective of this invention is to provide an easy, quick, simple practical way to generate more efficient and cost effective direct current electricity.

8. Another objective of this invention is that it promote and encourage other inventors to do additional research in homopolar machines generally but co-rotational magnets and disk embodiments in particular.

9. Another objective of this invention is to provide a system that is integrated and flexible.

10. Another objective of this invention is to provide a system that is easily useable and requires little if any training for manufacturing and use.

11. Another objective of this invention is that it meet all federal, state, local and other private standards guidelines, regulations and recommendations with respect to safety, environment, and energy consumption.

12. Another objective of this invention is that it can be made from modular standard materials and components that are also easily maintainable.

Other objectives advantages and features of this invention reside in its simplicity, elegance of design, ease of manufacture, service and use and even aesthetics as will become apparent from the following brief description of the drawings and the detailed description of the best mode preferred embodiments taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a prior art diagram of a typical homopolar generator.

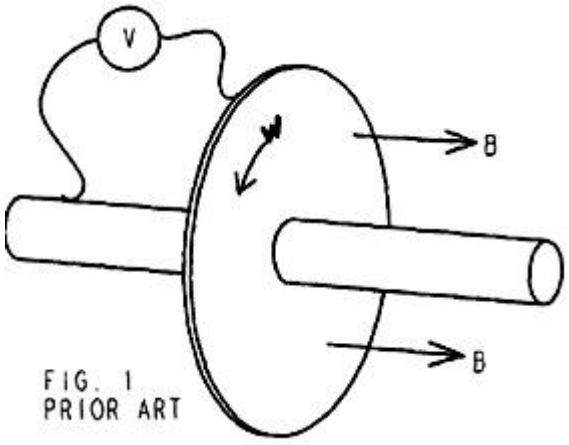


FIG. 1
PRIOR ART

FIG. 2 is a perspective, cutaway view of the magnetized rotor and stator.

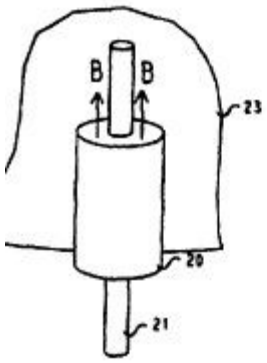


FIG. 2

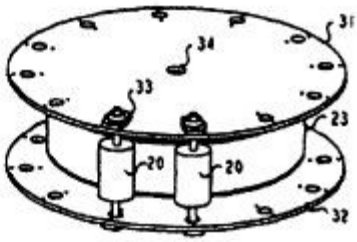


FIG. 3

FIG. 3 is an elevational view of the complete orbiting multi-rotor machine.

FIG. 4 is a cross sectional view of the invention.

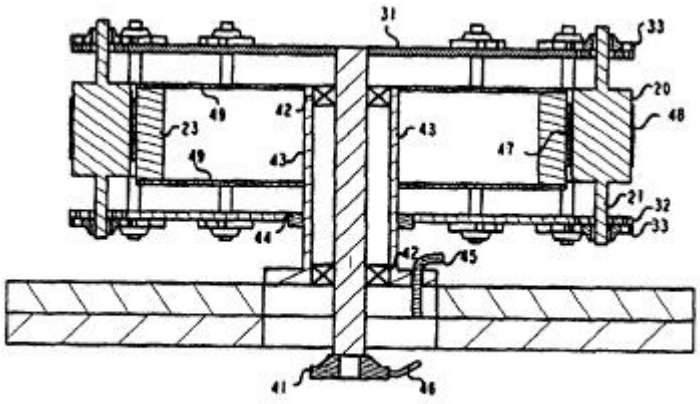
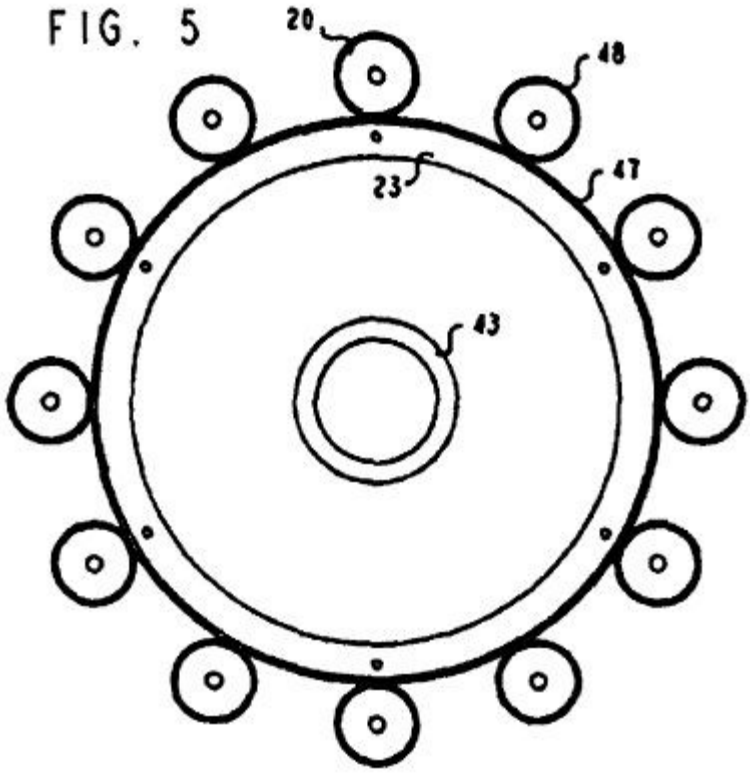


FIG. 4

FIG. 5 is a plan view from the top of the invention.



DETAILED DESCRIPTION OF THE BEST MODE PREFERRED EMBODIMENT

As shown in the drawings wherein like numerals represent like parts throughout the several views, there is generally disclosed in FIG. 1 is a state of the prior art.

Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

Turning first to FIG. 2 there is shown a perspective cutaway view of a portion of one embodiment of the present invention showing one of a multitude of rotors that are axially magnetized (B). This multitude mounted in parallel comprise the multi-rotor homopolar machine in close contact with a ring shaped stator that may be optionally magnetized in the direction opposite to the magnetic fields of the rotors.

Each rotor 20 has its own axle 21 which is circumferentially mounted vertically, arranged and dynamically balanced around a central vertical axis, on an electrically conductive but low permeability axle rod 21 made of copper, brass or bronze, that may penetrate the center of the entire magnetized rotor and rotatably attach to top and bottom bearing 33 on circular endplates 31, 32 shown in FIG. 3. In operation, the rotors orbit around the circular stator ring, which may or may not also be magnetized.

The invention is more completely shown in the elevational view of FIG. 3 with several rotors 20 rotatably attached to the top circular endplate 31 and bottom circular endplate 32 by electrically conductive bearings 33. The top endplate 31 is rigidly attached to the central axle 34 supporting the orbiting multi-rotor homopolar generator assembly. The hollow circular design of the

stationary ring stator 23 is also visible in FIG. 3, which can be optionally magnetized to increase performance output.

The bottom circular endplate 32 has a large hole in the center, more completely seen in FIG. 4, that allows inner attachment to insulating bearing 44 which optimally can be a non-contacting, low friction magnetic bearing since the weight of the rotor assembly is carried by the electrically conductive thrust bearing 41. The bottom endplate 32 is thus isolated electrically from the stationary Inner cylinder 43 that is the inner core of the stator. Inner circular assembly plates 49 of equal size and shape, that preferably are electrically conductive, rigidly attach the inner cylinder 43 to the stator ring 23. In accordance with the present invention, FIG. 4 shows the side cross sectional view edge on with a cutaway so that the central axle 34 and hollow inner cylinder design 43 is visible.

The insulating bearings 42 separate the central axle 34 from the inner cylinder 43. Both bearings 42 and 44 electrically maintain the separation of polarity of the electromotive force (emf) voltage of each rotor. The positive or negative polarity of the conductors depends of course on the rotation direction of the rotor magnets. One conductor 45 is electrically emerging from the stator assembly and ultimately emanates from the outer edge of each rotor 20 with the homopolar effect conducting the generated electricity through the rolling means 47 and 48. The opposite polarity conductor 46 is electrically emanating from the center axle 21 of each rotor 20 is connected to the electrically conductive thrust bearing 41.

In accordance with an important function of the present invention, there is shown in FIG. 4 one embodiment of an intimately contacting and engaging nonslip rolling means 47 and 48. As is well-known in the industry where good traction with a high coefficient of friction (1.6 or better) but sufficiently low electrical resistance is desired between two surfaces, an adherent coating of copper can be used on both facing surfaces of the stator 23 and rotor 20. For the copper coating, electro-deposition can be used or flame spraying of copper on the rotor and stator outer surfaces.

Another embodiment of rolling means 47 and 48 utilizes a geared electromechanical rotary joint developed by NASA Goddard Space Center (NASA Tech Briefs, December, 1994) which offers the advantage of a springy, low noise planetary gear contacting a stator ring gear. It was designed by NASA to overcome the disadvantages of sliding contacts and to ensure high traction desired for rolling electrical contacts.

The springy gears are made from beryllium copper which is a self-cleaning material with, in one embodiment, an average diameter of 6.35 mm with any reasonable number of teeth. Another concept to creating a rolling contact utilizes a magnetic sprocket design with small rare earth (samarium cobalt for example) magnets embedded perpendicularly in the surfaces of the stator ring and rotor magnets. The magnetic sprocket thus utilizes equally spaced magnets mounted normal to the axes of the stator and rotor.

To demonstrate an important feature of the invention, there is shown in FIG. 5 a plan view from the top of the balanced distribution of the rotors 20 around the stator assembly 43 with the outer stator ring 23 that are equally spaced and preferably dynamically balanced so the centrifugal forces are equal and opposite.

Theory of Operation ~

The main principle of operation is based on the fact that rotating cylindrical magnets creates a homopolar emf generation from Faraday's Law and the Lorentz Force. Physically, a rotating, non-inertial reference frame configuration can only be analyzed correctly with Einstein's general theory of relativity, utilizing a Thirring metric.

Particularly, where rotating cylindrical magnets and disk are synchronized and made co-rotational, such a co-rotational configuration makes the generator one piece like the earth's magnetic field itself. As the inventors explored this correspondence more closely, it was learned that the earth's molten, electrically conductive iron core also includes not one but several vortices in a coaxial circular arrangement. The inventors stumbled upon this concept while investigating the field rotation paradox and found that an orbiting, multi-rotor homopolar generator assembly would be analogous to the earth's electrically conductive, multi-vortex, magnetic, molten iron core.

The field rotation paradox can be easily resolved by an amateur DIY (Do It Yourself) scientist by comparing the interception of a linear magnetic field vs. a rotating magnetic field. In the former configuration the meter gives the same reading whether the magnet is moved with respect to a pickup coil of wire or vice versa but in the latter configuration the meter reading is seen only when the disk is moved with respect to rotary magnetic field of cylindrical magnet but not when the magnet is moved with respect to the disk. The former is consistent with special relativity while the latter is relying on general relativity. Both are loosely termed "relativistic."

Assembly and Use ~

The manufacturing, assembly and use of this invention is very simple even intuitive. The system of this invention can be readily assembled from the teaching provided in this disclosure by state of the art techniques and materials by a person of average skill in the art.

The applicant has described the essence of this invention. While this invention has been described with reference to an illustrative embodiment, this description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments as well as other embodiments of the invention will be apparent to a person of average skill in the art upon reference to this description.

Variations ~

Due to the simplicity and elegance of the design of this invention designing around it is very difficult if not impossible. Nonetheless many changes may be made to this design without deviating from the spirit of this invention. Examples of such contemplated variations include the following:

1. The shape and size, colors etc of the device or the packaging thereof may be modified.

2. Additional complimentary and complementary functions and features may be added.

3. The system of this invention may be adapted for other related uses.

4. Instead of cylindrical magnets, other types of magnets and mode of mounting on the disk may be employed to create the orbiting, rotational magnetic field.

5. The invention may be scaled up and down by several orders of magnitude

7. An experimental science toy version may be developed for education and entertainment of little young scientists of the future.

8. Homopolar generator may be employed in reverse as a motor to convert electrical energy into mechanical energy.

9. A homopolar servo motor version may be crafted based on this co-rotational magnet and disk concept.

10. Permanent cylindrical magnets may be replaced by equivalent configuration of electromagnets.

11. A portion of the emf generated may be fed back to cylindrical electromagnets to explore the possibility of a self-excited generator without violating any laws of nature.

Other changes such as aesthetics and substitution of newer materials as they become available, which substantially perform the same function in substantially the same manner with substantially the same result without deviating from the spirit of the invention may be made.

Following is a listing of the components used in the best mode preferred embodiment and the alternate embodiments for use with OEM as well as retrofit markets. For the ready reference of the reader the reference numerals have been arranged in ascending numerical order.

10 = Prior art generally

20 = Rotor(s)

21 = Axle, rod

23 = Stationary Ring Stator (Optionally Magnetized)

31 = Top circular end plate

32 = Bottom circular end plate

33 = Bearing

34 = Central Axle

41 = Electrically Conductive Thrust Bearing

42 = Insulating Bearing

43 = Stationary Hollow Inner Cylinder

44 = Insulating Bearing

45 = Opposite Polarity Conductor

46 = Opposite Polarity Conductor

47 = Non-Slip Rolling Means

48 = Non-Slip Rolling Means

49 = Inner Circular Assembly Plates

Definitions and Acronyms

A great care has been taken to use words with their conventional dictionary definitions. Following definitions are included here for clarification.

3D = Three Dimensional

Acyclic = Non-cyclic, non rotational or linear

DC = Direct Current as contrasted from alternating current electricity

DIY = Do It Yourself

DYNAMO = A device for converting mechanical energy into electrical energy (& Vice versa)

EMF = Electromagnetic Force

Homopolar = Same as unipolar

Integrated = Combination of two entities to act like one

Interface = Junction between two dissimilar entities

N = Magnetic North (Permanent or electro-magnet)

N-Machine = One Piece Faraday generator

OEM = Original Equipment Manufacturer

S = Magnetic South (Permanent or electro-magnet)

Unipolar = Same as homopolar

Note: It should be noted that the prior art uses unipolar, homopolar, acyclic and Faraday Disk Dynamo interchangeably.

While this invention has been described with reference to illustrative embodiments, this description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments as well as other embodiments of the invention will be apparent to a person of average skill in the art upon reference to this description. It is therefore contemplated that the appended claim(s) cover any such modifications, embodiments as fall within the true scope of this invention as defined by the appended claims.

Claims ~

What is claimed is:

1. An orbiting multi-rotor homopolar machine comprising:

a plurality of axially parallel, equally spaced, cylindrical, magnet rotors arranged circumferentially around the periphery of a central stator ring whose axis is parallel to each magnet rotor axis;

rolling means attached separately to the magnet rotors and to the stator ring for intimately contacting and enabling high friction non-slip rolling between magnet rotors and stator ring;

means for starting and sustaining orbiting rolling of the magnet rotors around stator ring as required;

bearing means rotatably securing the top and bottom ends of each magnet rotor to a corresponding circular endplate;

axle means located in the center of the stator ring rigidly attached to the top circular endplate;

electrically insulating bearing means rotatably securing the center of the bottom circular endplate to a coaxial inner cylinder located between the axle and stator ring; and

circular assembly means for rigidly attaching the inner cylinder to the stator ring.

2. The homopolar machine of claim 1 wherein the inner cylinder, circular assembly means, magnet rotors, axle means, circular endplate, and stator ring are made at least partially from electrically conductive material.

3. The homopolar machine of claim 1 wherein the rolling means comprises an electrically conductive geared electromechanical rotary joint.

4. The homopolar machine of claim 1 wherein the rolling means comprises an electrically conductive copper coating on the stator ring and magnet rotors.

5. The homopolar machine of claim 1 wherein the stator ring comprises electrically conductive magnetic material.

6. A method for starting and sustaining the orbiting of rolling cylindrical magnets arranged parallel to and circumferentially around the vertical axis of a central stator ring, while intimately

contacting and engaging non-slip rolling means between rotor magnets and the stator ring, rotatably securing the top and bottom ends of each rotor magnet by means of a bearing to a corresponding circular endplate, rigidly attaching to the top circular endplate a vertical axle coaxial with and in the stator ring, securing the center of the bottom circular endplate to a coaxial inner cylinder located between the axle and the stator ring by means of an electrically insulating bearing, and rigidly attaching the inner cylinder to the stator ring by means of a circular assembly.

7. An orbiting multi-rotor homopolar machine comprising:

a plurality of axially parallel, equally spaced, cylindrical, magnet rotors arranged circumferentially around the periphery of a central stator ring whose axis is parallel to each magnet rotor axis;

rolling means attached separately to the magnet rotors and to the stator ring for intimately contacting and enabling high friction non-slip rolling between the magnet rotors and stator ring;

means for starting and sustaining orbiting rolling of the magnet rotors around the stator ring as required;

bearing means rotatably securing the top and bottom ends of each magnet rotor to a corresponding circular endplate;

axle means located in the center of the stator ring rigidly attached to the top circular endplate;

electrically insulating bearing means rotatably securing the center of the bottom circular endplate to a coaxial inner cylinder located between the axle and stator ring; and

circular assembly means for rigidly attaching the inner cylinder to the stator ring; wherein said inner cylinder, said circular assembly means, said magnet rotors, said axle means, said circular endplate, and said stator ring are made at least partially from electrically conductive material.

8. The homopolar machine of claim 7 wherein the rolling means comprises an electrically conductive geared electromechanical rotary joint.

9. The homopolar machine of claim 7 wherein the rolling means comprises an electrically conductive copper coating on the stator ring and magnet rotors.

10. The homopolar machine of claim 7 wherein the stator ring comprises electrically conductive magnetic material.

V. V. ROSCHIN & S. M. GODIN
Searl Effect Generator Prototypes

***New Energy Technologies*, Vol. 2, pp. 242-245**

Testing of Small Prototype to Investigate Searl's Effect

S. M. Godin and V.V. Roschin

The authors go further in the research of possibility to receive free energy by means of rotating constant magnets (Searl's Effect).

The aim of generator compact model (GCM) testing was studying of possibility to produce a small and maximum cheap model, which uses the ceramic magnets. Laboratory research of this model of generator was aimed at the discovery of self-generation effects and effects of weight change, which were already achieved on the full-size generator [1].

A general view of GCM is shown in Figure 1. The generator represented a mechanical system consisting of general construction as a cylinder made of stainless steel divided by it height in approximately two equal parts. The direct current motor with collector was situated in the lower part; windings of stator and rotor were connected in series.

Figure 1

Fig.1.
General view R_{mx}=59mm

In the upper part of the construction on the axis of motor the rotor is situated as a cylindrical ceramic magnet with a central hole made on the base of cobalt-samarium mix. The magnet is magnetized vertically and inserted into the steel fixture, which preserves the magnet from destruction during the quick rotation. Small magnetic rollers also made of ceramic magnets and magnetized along the axis of rotation were placed around the rotor. All 12 rollers were placed into the aluminum cylinders, which preserve their brittle ceramics from mechanical impact during the work in emergency conditions. The main idea of such construction consists in the fact that in initial state the rollers were attracted by the magnet of rotor to the side face. Due to the repulsion of the rollers from each other, the distance between them appeared automatically. With this distance they uniformly distributed along the entire perimeter of the rotor. During acceleration of the rotor the rollers diverge from the rotor step by step and begin to run in the outside cylindrical fixture, which is placed around the rotor at the distance of 1.5 mm from the external surface of rollers in the initial states. The height of the rotor magnet is 24 mm, the diameter of the inside hole is 40 mm. All other geometrical sizes and ratios are given in Figure 2.

Figure 2

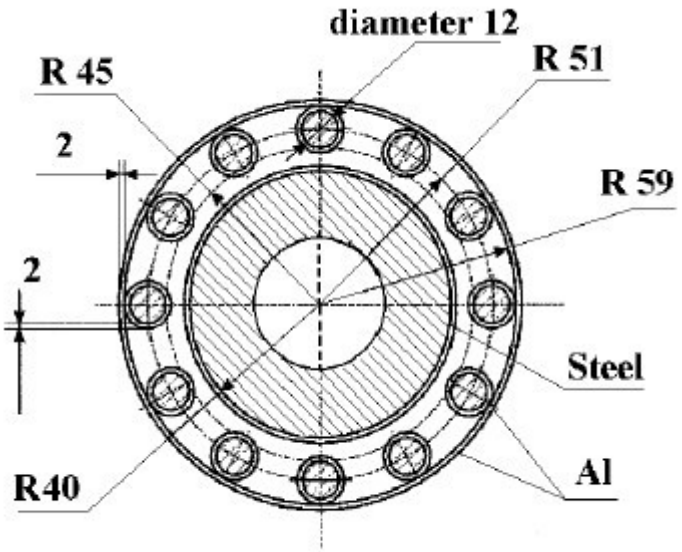


Fig.2

It was supposed that with a certain acceleration of rotation the rollers would begin to rotate inside the outside fixture with self-acceleration and would carry metal surface of rotor device. This mode will be easy to discover due to the possible decrease of the current consumed by the electric motor. Thus, the aim of GCM testing was an attempt to find the features of energy transformation of environment which lies in the self-acceleration of the rotor device or other characteristic effects concentric magnetic walls around the device and fall of temperature) discovered already. The program of device testing included registration of dependence of rotational speed of the rollers along the outside fixture from rotation speed of the motor.

Appearance of GCM is shown in Figure 3, when this device is ready to test in laboratory conditions. GCM was placed on the massive grounded steel plate. The power supply made in the form of controlled transformer, isolating transformer, bridge diode rectifier and capacitive filter were placed on the right. Besides, the generator of reference frequency G3-112 and frequency meter C3-54 were placed here.

Figure 3

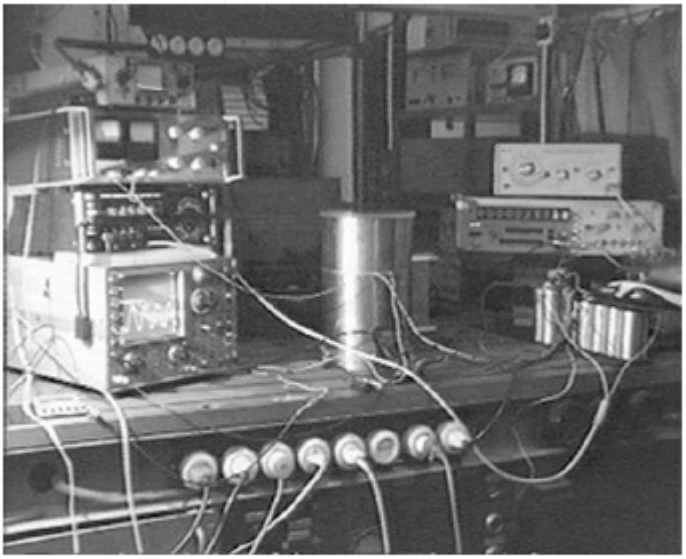


Fig.3.
Lab setup

The 2-channel oscilloscope C1-99, digital combined unit TSH300 applied for the measurement of consumption current and power supply TEC-88 (0-30 V, 0-2.5 A) applied for power supply of the optoelectronic sensor of device rotation were placed on the left. The measurement of rotation speed of the rollers was made with an induction-type sensor, which was placed at the height of the rollers, on the reverse side of the aluminum fixture. The rollers after they separated from the rotor, rolled along this fixture. During the passing of every roller by the induction-type sensor, the impulse of voltage with the amplitude of about 1V was produced. This voltage was supplied to one of the inputs of 2-channel oscilloscope for direct observation on the screen. A signal from the reference generator connected with the frequency meter was supplied to the second input of the oscilloscope.

Synchronization of scanning of the oscilloscope was provided from the same reference signal. The frequency of the signal on the reference generator was set to provide the most stable immovable pattern on both channels of the oscilloscope. An accurate measurement was made according to the data from the frequency meter. Such method of measurement was chosen because the applied collector motor of direct current ad permanent deviations of rotation rate due to the change of voltage in the mains, heating of bearings, collector and other reasons. All this hampered the reception of an accurate value of average rotation rate directly from the readings of the frequency meter. It was necessary to divide the readings of frequency meter by 12 to receive the real value of rotation rate in rates per second (rate of running around the fixture) of the rollers.

Measurement of rotation rate of the rotor was made in an analogous way, but as a sensor we used the self-made sensor on the base of optic pair IR emitter-receiver with an open optic channel. The sensor was assembled on the textolite baseplate and attached to the upper plexiglass head of GCM by means of usual plasticine. Using this sensor we could quickly and effectively adjust the necessary operating gap between the surface of optoelectronic couple and surface of special metal disk with 25 dark and 25 light sectors applied on it. Thus, during one rotation period of the

rotor the photon-coupled sensor gave 25 impulses of voltage, which were transferred to the oscilloscope for immediate observation. The appearance of photon-coupled sensor or rotations attached to the upper plexiglass head of the GCM unit is shown in Figure 4.

Figure 4

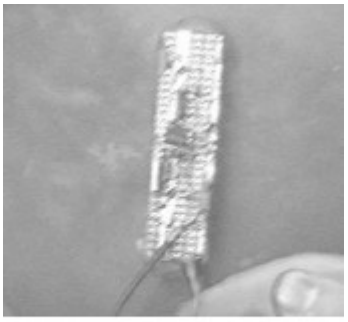


Fig.4.
Optron sensor

In Figure 5 you can see the oscillograms of signal from the photon-coupled sensor of rotation (upper beam) and harmonic signal from the reference generator in the moment of coincidence of frequencies with a one-phase accuracy. The real rotation rate of the rotor was determined as a measured frequency (rate) of generator divided by 25 (number of dark and light sectors on the disk of rate controller).

Figure 5

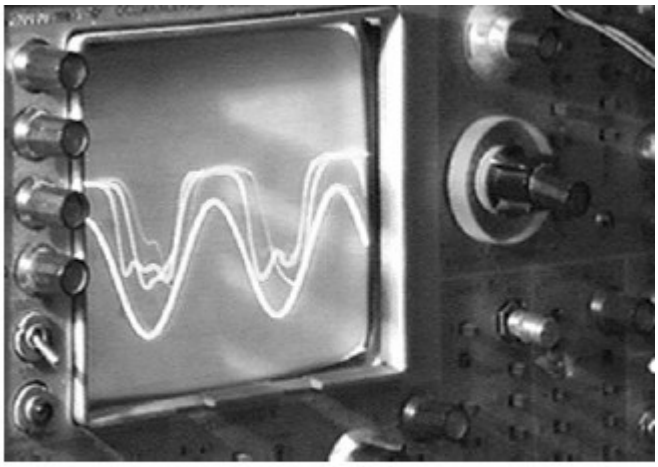


Fig.5.
Signal from the sensor

To receive reliable information on the characteristics of the electromechanical system 'motor-permanent magnet of the rotor' there were made several bare measurements without installation of the rollers. Measurements were made with the placing of magnet north up and vice versa.

As we can see from the diagrams of dependence of the motor consumption current from the applied voltage of power supply, the strength of consumption current increases with the voltage of power supply and reaches its maximum at 0.31 A with the minimal possible rotation rate of

the rotor. The strength of consumption current does not depend on the polarity of installation of the magnet in the limits of experimental accuracy. For the given motor there is an area of minimal consumption current, which lies in the diapason from 40 to 80 W.

We got similar curves of rotation speed for the cases of different location of magnets of the rotor, which means the independence of rotation speed from the polarity of the magnet of the rotor.

The results of measurements of rotation speeds of the rotor and rollers (given separately) are presented in Table 1.

Table 1

Table 1

N- pole up							S - pole up				
#	U (V)	I mA	freg. rot	rps	freg. rol	rps	I mA	freg. rot.	rps	freg. rol.	rps
1	120	196	943	37.72	102.5	8.54	199	941	37.64	102	8.50
2	110	181	900	36	102.5	8.54	183	901	36.04	102	8.50
3	100	170	857	34.28	102.5	8.54	172	858	34.32	102	8.50
4	90	160	818	32.72	102.5	8.54	162	818	32.72	102	8.50
5	80	157	778	31.12	102.5	8.54	155	778	31.12	102	8.50
6	70	149	738	29.52	102.5	8.54	150	738	29.52	102	8.50
7	60	147	694	27.76	102.5	8.54	146	694	27.76	102	8.50
8	50	148	650	26	102.5	8.54	148	650	26	102	8.50
9	40	154	599	23.96	102.5	8.54	154	599	23.96	102	8.50
10	30	170	530	21.2	101	8.42	169	533	21.32	100.5	8.38
11	25	183	480	19.2	97	8.08	180	484	19.36	97	8.08
12	23	199	454	18.16	93	7.75	193	457	18.28	93.5	7.79
13	21	210	418	16.72	81	6.75	218	426	17.04	79.5	6.63
14	19	219	394	15.76	79	6.58	234	381	15.24	77	6.42
15	17	239	351	14.04	72.5	6.04	255	339	13.56	68.5	5.71
16	15	265	295	11.8	70.5	5.88	280	266	10.64	67	5.58
17	13	290	212	4.48	67	5.58	300	200	8	65	5.42
18	12	330	56	2.24	61.5	5.13	300	153	6.12	48	4.00

Here, as in the previous example, two cases are considered. They are the case, when the magnet was installed with its north pole up and an opposite case. The poles of the rollers change accordingly. We should note that with the slow change of power supply voltage, we practically always observed the instability of the trajectories of the rollers and their tailing from the operating surface, which led to the adhesion of one or some pairs of the rollers together.

This fact distorted the pattern of measurements, and we had to introduce correction factors during the calculation of rotation speed of the rollers. These factors depend on the number of fallen down or adhered rollers in pairs. This table was made taking into account these correction factors and it is an average one according to the results of five tests. As we can see from the table, no self-acceleration of the rollers was found. After the speed reaches a particular value of 8.5 rps, the speed of the rollers stabilizes and does not increase in spite of the increase of rotation speed of the rotor magnet.

Also we can see from Table 1 that the rollers always have a tendency to retard and after the full separation with the voltage of 20-23 V.

Concerning the polarity of magnet location we can say that it does not influence the rotation speed of the rotor and rollers in the limits of miscalculation in determination of speed and voltage in the given experiment. Some differences in speed are defined only by mechanical characteristics of the rollers and surface o the fixture, which was used for revolving around. We should say that the outside surfaces of the rollers and the surface wer made of the same material (aluminum); that's why they have a tendency of attrition even during one experiment (10 minutes). Due to this reason we couldn't get full reiteration, but the accuracy was sufficient to establish the fact of full absence of the self-acceleration effects and some differences between polarities of installation of the rotor magnet and rollers.

Unfortunately, we couldn't find any anomalies in the temperature distribution and distribution of magnetic field around the converter. 'Magnetic and heat walls' discovered in experiments with a big converter were almost absent around the small device.

Conclusion

These experiments proved the point of view that during the device operation the nonlinearity of the wave processes, which take place in quantum medium (ether) plays the main role. It is evident that there is some critical value of parameters in the magnetic system of the converter (mass, induction of magnetic field) and only in the case of excess of these parameters the appearance of abovementioned effects is possible.

References

1 – V. Roschin, S. Godin: An Experimental Investigation of Physical Effects in a Dynamic Magnetic System; New Energy Technologies, Vol. 1, July-August 2001, pp. 3-5.

Editor's Note: -- Alexander Frolov --- I have to say about my personal opinion of this experimental work. It is a very strange project. I am not sure if these are 100% true experimental results due to absence of real prototype at the present time (Only the description of 7 KWt system was published, It was built in 1002, according to S, Godin). On the other hand, the theory of this energy converter and its description by Godin and Roschin is in good correlation with other theories on inner structure of physical vacuum. Faraday Lab Ltd will develop this research direction and we hope to present our own experimental results in the future.

Photo: Sergei M.Godin (left) and Alexander V. Frolov (right), St.Petersburg, August 2001

Vladimir ROSCHIN & Sergi GODIN

(# 3) Homopolar Machine

Continuing research with the Searl Effect ...

[PDF]

An Experimental Investigation of the Physical Effects in a Dynamic Magnetic System

V. V. Roshchin and S. M. Godin

Institute of High Temperatures, Russian Academy of Sciences, Moscow, Russia

e-mail: rochtchin@mail.ru

e-mail: serjio@glasnmet.ru

Received June 16, 2000

Abstract—It is demonstrated that a magnetic system based on rare-earth magnets is capable of converting various forms of the energy, provided that certain critical operating regime is set. As the critical regime is attained, the experimental setup becomes energetically fully autonomous. This is accompanied by local variations in the total structure weight, a decrease in the surrounding air temperature, and the formation of concentric "magnetic walls" at a distance of up to 15 m from the experimental setup. © *2000 MAIK "Nauka/Interperiodica".*

USP 6822361

Orbiting Multi-Rotor Homopolar System

[PDF]

Vladimir V. Roschin, et al

An orbiting multi-rotor homopolar machine employs axially parallel, cylindrical, electrically conductive magnets arranged circumferentially around vertical axis of central stator ring, intimately contacting and engaging non-slip rolling between rotor magnets and stator. A bearing rotatably...

Inventors: Vladimir Vitalievich Roschin, Sergi Mikhailovich Godin
Assignee: Energy & Propulsion Systems LLC
U.S. Classification 310/178; 310/114
International Classification H02K 3100
Citations
Patent Number Title Issue date
406068 WIRE CABLE Jul 2, 1889
645943 GUSTAF DALEXN AND ARTHUR EULTQVIST Mar 27, 1900
3185877 DIRECT CURRENT HOMOPOLAR GENERATOR May 25, 1965
3465187 HOMOPOLAR GENERATOR HAVING PARALLEL POSITIONED FARADAY DISK STRUCTURES Sep 2, 1969
5241232 Homopolar motor-generator Aug 31, 1993
5278470 Homopolar machine which acts as a direct current (DC) high voltage generator or motor Jan 11, 1994
5977684 Rotating machine configurable as true DC generator or motor Nov 2, 1999
6051905 Homopolar generator Apr 18, 2000

Referenced by

Patent Number Title Issue date

7459823 Resonant unipolar generator Dec 2, 2008

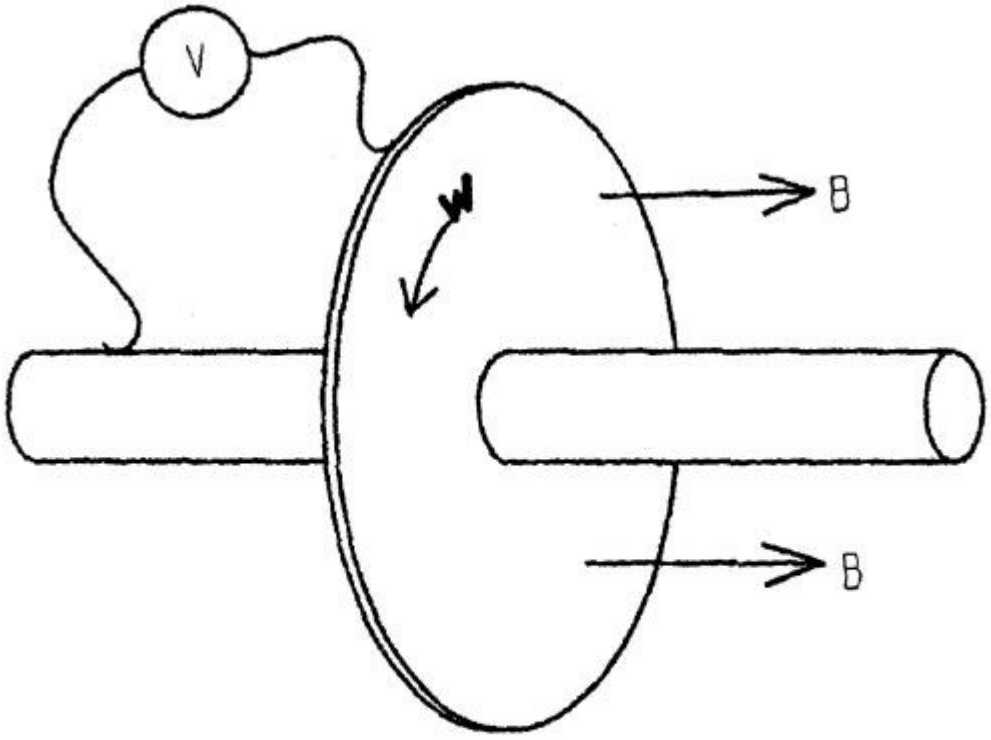


FIG. 1
PRIOR ART

FIG. 1 is a prior art diagram of a typical homopolar generator.

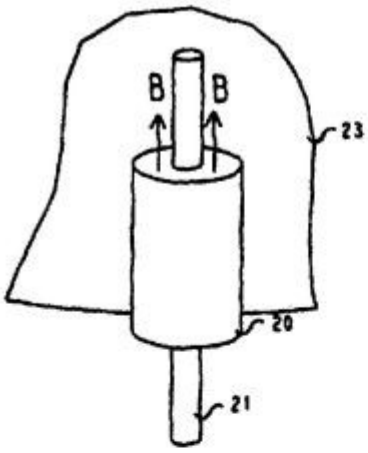


FIG. 2

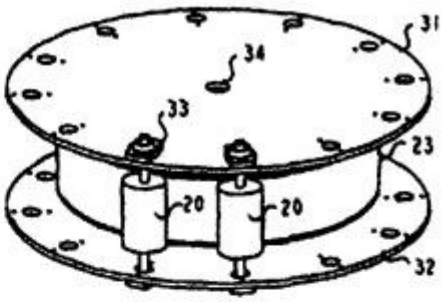


FIG. 3

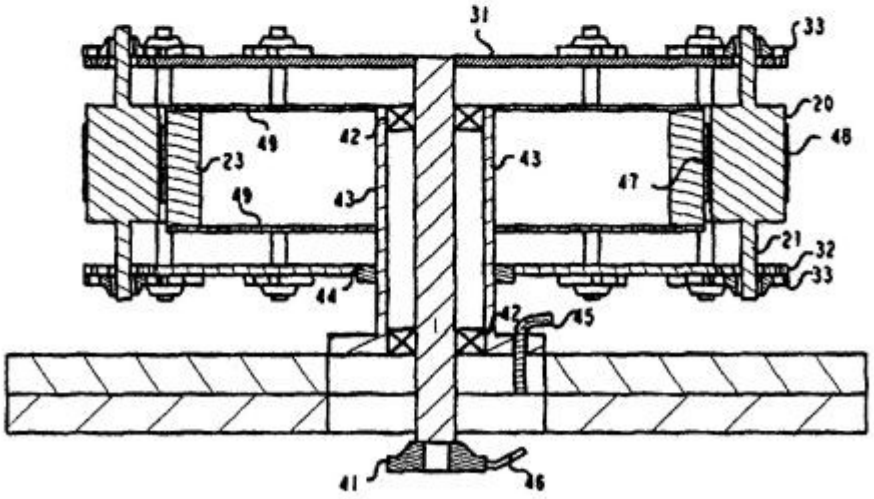


FIG. 4

FIG. 2 is a perspective, cutaway view of the magnetized rotor and stator.

FIG. 3 is an elevational view of the complete orbiting multi-rotor machine.

FIG. 4 is a cross sectional view of the invention.

FIELD OF THE INVENTION

[0003] This invention relates generally to the field of direct current electrical motors and generators that operate without the need for commutation and/or rectification, and more particularly to multi-rotor homopolar machines which derive their emf (electromotive force) from co-rotational magnets and metallic disk embodiment.

BACKGROUND

[0004] Back in 1831, Michael Faraday discovered that a cylindrical magnet suspended by a string and touching a mercury bath at the bottom could generate electricity while spinning along its axis if a second electrical contact was made at the periphery of the midpoint of the magnet. His experiment was a one-piece homopolar machine since the magnet and conductor were joined together. Such Faraday generators have also been called acyclic, unipolar or homopolar generators because no commutation or alternating of the magnetic poles is necessary for this machine in order to generate electricity.

[0005] The type of electrical output is most often direct current (DC) unless specific means are designed to provide an interruption of radial conduction and thus simulate alternating current (AC). Historically, DC was championed by Thomas Edison during the early part of the 20th century while at the same time AC was championed by Nikola Tesla and George Westinghouse. In the future, DC will be coming back into style with the emergence of ambient temperature superconductive cables. Therefore, highly efficient homopolar generators will be in demand to meet the future market demand for DC electricity.

[0006] Homopolar generators usually have a single disk or drum rotating in a stationary magnetic field with sliding contacts. The sliding contacts often present high resistance however. The construction and operation of homopolar machines for electric propulsion of marine vessels or railguns for example is already well known. Such machines include motors and generators wherein electrical current flows through a conductor situated in a magnetic field during rotation of the machine rotor.

[0007] In the case of a homopolar motor, the current will develop a J*B force perpendicular to the direction of its flow through the conductor and that of the magnetic field. In the case of a homopolar generator, a voltage dependent on the rotational speed, magnetic field, and radius, is induced in a conductor moving within the magnetic field. When current is drawn from the homopolar generator, it also develops a J*B force for the same reason as with the motor but is referred to as back torque or armature reaction. General reference information including basic principles used to reduce back torque can be found in The Homopolar Handbook by Thomas Valone (ISBN 0-9641070-1-5).

[0008] The prior art rarely includes a one-piece homopolar machines that rotate the magnet with the disk. Even more unknown is the concept of rolling contacts. Eliminating sliding contacts is shown in the "Planetary Homopolar Generator," IBM Technical Disklosure Bulletin, Vol. 17, No. 6, p. 1786-87, November, 1974, H. D. Varadarajan.

[0009] Using a conducting belt or rolling contacts to gather current from a magnetic field flux cutting rotor, there is an annular magnetic field through which the rotor executes a planetary motion.

[0010] The large stresses resulting from the centrifugal force of the massive, unbalanced planetary rotor is a distinct disadvantage, prohibiting high speed operation. Thus, only a low rate of rotation is possible with the IBM design.

[0011] The "Direct Current Homopolar Machine" U.S. Pat. No. 5,587,618 to Hathaway demonstrates an analogous concept of relative motion between conductive orbiting shaft and a stationary disk-shaped magnetized armature.

[0012] However, the design is a bit cumbersome to be practical. Science Applications International Corporation claims a conductive belt, dual disk "Homopolar Motor-Generator" in U.S. Pat. No. 5,241,232 to Reed that apparently reinvents the "Dynamo Electric Machine" of U.S. Pat. No. 406,968 patented by none other than Nikola Tesla in 1889 that also has two unipolar magnetized rotors connected by a conductive belt. The belted dual unipolar machines solve one of the problems that plague the field by offering two sliding contacts at the low speed surface on the axle. However, the present invention requires only one sliding contact on the axle. These conductive belt machines also demonstrate, in principle, the concept of a multi-rotor, planetary design, by the process of coordinate transformation, since relative motion is the key to the operation of a homopolar generator. The concept of rolling contact is demonstrated with the Dalen "Dynamo Electric Machine" U.S. Pat. No. 645,943, where two disks are turning in opposite directions while in contact with each other at their periphery. However, the axle of each disk must remain fixed in place whereas each axle is in orbiting motion in the present invention.

[0013] Homopolar machines can reversibly function as motors as well, such as flywheels, and used as energy storage devices. First used in transportation applications in the 1950's, flywheel powered buses were designed to have the flywheel accelerated at every stop. Composite rotors currently have been developed which can spin at very high revolutions (100,000 revolutions per second); and the speed is limited by the tensile strength of the rim of the rotor. By using a multi-rotor design, the centrifugal forces of a large disk can be greatly reduced and still maintain high-energy storage or production. By using magnetic bearings, the friction on the axis of the rotor can be reduced sufficiently so that such rotors can maintain most of the energy for several days.

[0014] The IBM Varadarajan planetary rotor is unbalanced and has a low rate of magnetic flux cutting due to its annular magnetic field design. The Hathaway direct current machine has a lot of unbalanced conductive material orbiting the central magnetized disk which limits the rotational speed.

[0015] The conductive belt designs can be subject to oxidation and slippage, even requiring a toothed timing belt on each axle as well. With most disk models of homopolar generators, as opposed to drum designs, sliding contacts are the single most important contribution of resistance inhibiting the power output of the machine. Internal resistance is the only limit to the output capability of a homopolar generator and it is important to reduce all sources of internal resistance to obtain maximum power output for a given input torque. Rather than use high resistance carbon brushes, medium resistance silver-graphite brushes or dangerous conductive liquids such as mercury, low temperature solder, or sodium-potassium, there is a need to eliminate frictional sliding contact at the high speed periphery of the magnetized rotor completely. Furthermore, rather than maintaining two sliding contacts which contribute friction and resistance, even in the rolling and belted designs, there is a need to cut the number in half to only one high current sliding contact. The present invention satisfies both of these needs.

SUMMARY

[0016] The present invention derives direct current electricity by co-rotating a plurality of magnets and a metallic disk. It comprises an improved homopolar machine with dynamically balancing, axially parallel, cylindrical, electrically conductive magnets arranged circumferentially around the vertical axis of central stator ring. Such a design can be referred to as distributed generation since each magnet rotor generates only a fraction of the current that is transmitted through the machine. Thus, the conductive bearings contacting the center of each end of the magnet rotors may carry only one tenth or less of the total current.

[0017] The multi-rotor orbiting homopolar also does not include sliding contacts at each magnetized rotor rim but instead utilizes a suitable rolling means attached separately to magnets and also to the stator ring for intimately contacting and engaging non-slip rolling between magnets and stator as they orbit around the stator. The magnetized rotors maintain rotational synchronism and equal relative position to each other with a bearing means rotatably securing the top and bottom end of each magnet to a corresponding electrically conductive circular endplate.

[0018] The electrical energy is extracted, or input if used as a motor, through contacts on the conductive stator and at the machine's electrically conductive axle located in the center of the machine while rigidly attached to the top circular endplate that rotates with all of the individually magnetized rotors. The only single, high current, moving contact that is required is an electrically conductive thrust bearing that supports the central axle. An insulating thrust bearing meanwhile separates the axle from the center of bottom circular endplate. The stator, which is of course stationary, accomplishes the second contact means through a standard electrical connection with no need for any relative motion sliding contact. The stator may be optionally magnetized in the opposite direction to the magnetized rotors in order to increase the coercive force or magnetic flux density.

[0019] The drawings constitute a part of this specification and include exemplary embodiments to the invention, which may be embodied in various forms. It is to be understood that in some instances various aspects of the invention may be shown exaggerated or enlarged to facilitate an understanding of the invention.

The Problem

[0020] The problem this invention solves is that it generates high power direct current electricity without the need for commutation and rectification, otherwise the internal resistance losses are high.

[0021] The problems with prior art devices, processes and systems can be categorized as follows.

[0022] 1. Require commutation or rectification to generate direct current electricity.

[0023] 2. Rely on more than one current brush which often have high speed contact.

[0024] 3. Do not distribute magnetic field power generation by multi-rotor orbiting magnets in

homopolar machines or systems.

[0025] 4. Internal resistance losses are usually high.

[0026] 5. Neither efficient nor cost effective.

[0027] 6. Neither simple nor practical for most applications.

Prior Art

[0028] A preliminary limited prior art search was not commissioned but the inventor is intimately familiar with the prior art. Following are typical examples of the prior art arranged in reverse chronological order for ready reference of the reader.

[0029] 11) Non-Provisional Utility U.S. Pat. No. 6,051,905 issued to Richard Clark on Apr. 18, 2000 for "Homopolar Generator"

[0030] 10) Non-Provisional Utility U.S. Pat. No. 5,977,684 presented to Ted Lin on Nov. 2, 1999 for "Rotating Machine Configurable as True DC Generator or Motor"

[0031] 09) Non-Provisional Utility U.S. Pat. No. 5,864,198 earned by Joseph Pinkerton on Jan. 26, 1999 for "Brushless Generator"

[0032] 08) Non-Provisional Utility U.S. Pat. No. 5,587,618 issued to George Hathaway on Dec. 24, 1996 for "Direct Current Homopolar Machine"

[0033] 07) Non-Provisional Utility U.S. Pat. No. 5,278,470 graced upon Zacharias Neag on Jan. 11, 1994 for "Homopolar Machine which acts as a Direct Current (DC) High Voltage Generator or Motor"

[0034] 06) Non-Provisional Utility U.S. Pat. No. 5,241,232 honorably given to Jay Reed on Aug. 31, 1993 for "Homopolar Motor-Generator"

[0035] 05) Non-Provisional Utility U.S. Pat. No. 5,011,821 published in the name of Charley McCullough on Apr. 30, 1991 for "Method and Apparatus for Generating Electricity"

[0036] 04) Non-Provisional Utility U.S. Pat. No. 3,465,187 issued to Onezime Breaux on Sep. 2, 1969 for "Homopolar Generator Having Parallel Positioned Faraday Disk Structures"

[0037] 03) Non-Provisional Utility U.S. Pat. No. 3,185,877 presented to Anthony Sears on May 25, 1965 for "Direct Current Homopolar Generator"

[0038] 02) Non-Provisional Utility U.S. Pat. No. 645,943 graced upon inventor Gustaf Dalen on Mar. 27, 1900 for "Dynamo Electric Machine"

[0039] 01) Non-Provisional Utility U.S. Pat. No. 406,968 bestowed upon none other than Nikola Tesla himself in 1889 for "Dynamo Electric Machine"

[0040] None of the prior art devices known to the applicant or his attorney disclose the EXACT embodiment of this inventor that constitutes a simple, elegant and affordable system for an orbiting Multi-Rotor Homopolar direct current electricity generation

Objectives

[0041] Unfortunately none of the prior art devices singly or even in combination provide for all of the objectives as established by the inventor for this system as enumerated below.

1. It is an objective of this invention to provide devices, method and system for generation of high power direct current electricity without commutation and rectification.

2. The primary objective of the invention is orbiting multi-rotor cylindrical magnets in rolling contact that eliminates friction while generating DC electricity.

3. Another objective of the invention is to provide high efficiency, low noise and low resistance in a high current generator.

4. Another objective of the invention is that it uses readily available materials in a dynamically balanced arrangement.

5. Another objective of the invention is safety through reduced internal stress than comparable homopolar machines with a single rotor.

6. Another objective of the invention is that it provides distributed generation around an air core.

7. Another objective of this invention is to provide an easy, quick, simple practical way to generate more efficient and cost effective direct current electricity.

8. Another objective of this invention is that it promote and encourage other inventors to do additional research in homopolar machines generally but co-rotational magnets and disk embodiments in particular.

9. Another objective of this invention is to provide a system that is integrated and flexible.

10. Another objective of this invention is to provide a system that is easily useable and requires little if any training for manufacturing and use.

11. Another objective of this invention is that it meet all federal, state, local and other private standards guidelines, regulations and recommendations with respect to safety, environment, and energy consumption.

12. Another objective of this invention is that it can be made from modular standard materials and components that are also easily maintainable.

[0054] Other objectives advantages and features of this invention reside in its simplicity, elegance of design, ease of manufacture, service and use and even aesthetics as will become apparent from the following brief

description of the drawings and the detailed description of the best mode preferred embodiments taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a prior art diagram of a typical homopolar generator.

FIG. 2 is a perspective, cutaway view of the magnetized rotor and stator.

FIG. 3 is an elevational view of the complete orbiting multi-rotor machine.

FIG. 4 is a cross sectional view of the invention.

FIG. 5 is a plan view from the top of the invention.

DETAILED DESCRIPTION OF THE BEST MODE PREFERRED EMBODIMENT

[0060] As shown in the drawings wherein like numerals represent like parts throughout the several views, there is generally disclosed in FIG. 1 is a state of the prior art.

[0061] Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

[0062] Turning first to FIG. 2 there is shown a perspective cutaway view of a portion of one embodiment of the present invention showing one of a multitude of rotors that are axially magnetized (B). This multitude mounted in parallel comprise the multi-rotor homopolar machine in close contact with a ring shaped stator that may be optionally magnetized in the direction opposite to the magnetic fields of the rotors.

[0063] Each rotor 20 has its own axle 21 which is circumferentially mounted vertically, arranged and dynamically balanced around a central vertical axis, on an electrically conductive but low permeability axle rod 21 made of copper, brass or bronze, that may penetrate the center of the entire magnetized rotor and rotatably attach to top and bottom bearing 33 on circular endplates 31, 32 shown in FIG. 3. In operation, the rotors orbit around the circular stator ring, which may or may not also be magnetized.

[0064] The invention is more completely shown in the elevational view of FIG. 3 with several rotors 20 rotatably attached to the top circular endplate 31 and bottom circular endplate 32 by electrically conductive bearings 33. The top endplate 31 is rigidly attached to the central axle 34 supporting the orbiting multi-rotor homopolar generator assembly. The hollow circular design of the stationary ring stator 23 is also visible in FIG. 3, which can be optionally magnetized to increase performance output.

[0065] The bottom circular endplate 32 has a large hole in the center, more completely seen in FIG. 4, that allows inner attachment to insulating bearing 44 which optimally can be a non-

contacting, low friction magnetic bearing since the weight of the rotor assembly is carried by the electrically conductive thrust bearing 41. The bottom endplate 32 is thus isolated electrically from the stationary Inner cylinder 43 that is the inner core of the stator. Inner circular assembly plates 49 of equal size and shape, that preferably are electrically conductive, rigidly attach the inner cylinder 43 to the stator ring 23. In accordance with the present invention, FIG. 4 shows the side cross sectional view edge on with a cutaway so that the central axle 34 and hollow inner cylinder design 43 is visible.

[0066] The insulating bearings 42 separate the central axle 34 from the inner cylinder 43. Both bearings 42 and 44 electrically maintain the separation of polarity of the electromotive force (emf) voltage of each rotor. The positive or negative polarity of the conductors depends of course on the rotation direction of the rotor magnets. One conductor 45 is electrically emerging from the stator assembly and ultimately emanates from the outer edge of each rotor 20 with the homopolar effect conducting the generated electricity through the rolling means 47 and 48. The opposite polarity conductor 46 is electrically emanating from the center axle 21 of each rotor 20 is connected to the electrically conductive thrust bearing 41.

[0067] In accordance with an important function of the present invention, there is shown in FIG. 4 one embodiment of an intimately contacting and engaging nonslip rolling means 47 and 48. As is well-known in the industry where good traction with a high coefficient of friction (1.6 or better) but sufficiently low electrical resistance is desired between two surfaces, an adherent coating of copper can be used on both facing surfaces of the stator 23 and rotor 20. For the copper coating, electro-deposition can be used or flame spraying of copper on the rotor and stator outer surfaces.

[0068] Another embodiment of rolling means 47 and 48 utilizes a geared electromechanical rotary joint developed by NASA Goddard Space Center (NASA Tech Briefs, December, 1994) which offers the advantage of a springy, low noise planetary gear contacting a stator ring gear. It was designed by NASA to overcome the disadvantages of sliding contacts and to ensure high traction desired for rolling electrical contacts.

[0069] The springy gears are made from beryllium copper which is a self-cleaning material with, in one embodiment, an average diameter of 6.35 mm with any reasonable number of teeth. Another concept to creating a rolling contact utilizes a magnetic sprocket design with small rare earth (samarium cobalt for example) magnets embedded perpendicularly in the surfaces of the stator ring and rotor magnets. The magnetic sprocket thus utilizes equally spaced magnets mounted normal to the axes of the stator and rotor.

[0070] To demonstrate an important feature of the invention, there is shown in FIG. 5 a plan view from the top of the balanced distribution of the rotors 20 around the stator assembly 43 with the outer stator ring 23 that are equally spaced and preferably dynamically balanced so the centrifugal forces are equal and opposite.

Theory of Operation

[0072] The main principle of operation is based on the fact that rotating cylindrical magnets creates a homopolar emf generation from Faraday's Law and the Lorentz Force. Physically, a rotating, non-inertial reference frame configuration can only be analyzed correctly with

Einstein's general theory of relativity, utilizing a Thirring metric.

[0073] Particularly, where rotating cylindrical magnets and disk are synchronized and made co-rotational, such a co-rotational configuration makes the generator one piece like the earth's magnetic field itself. As the inventors explored this correspondence more closely, it was learned that the earth's molten, electrically conductive iron core also includes not one but several vortices in a coaxial circular arrangement. The inventors stumbled upon this concept while investigating the field rotation paradox and found that an orbiting, multi-rotor homopolar generator assembly would be analogous to the earth's electrically conductive, multi-vortex, magnetic, molten iron core.

[0074] The field rotation paradox can be easily resolved by an amateur DIY (Do It Yourself) scientist by comparing the interception of a linear magnetic field vs. a rotating magnetic field. In the former configuration the meter gives the same reading whether the magnet is moved with respect to a pickup coil of wire or vice versa but in the latter configuration the meter reading is seen only when the disk is moved with respect to rotary magnetic field of cylindrical magnet but not when the magnet is moved with respect to the disk. The former is consistent with special relativity while the latter is relying on general relativity. Both are loosely termed "relativistic."

Assembly and Use

[0076] The manufacturing, assembly and use of this invention is very simple even intuitive. The system of this invention can be readily assembled from the teaching provided in this disclosure by state of the art techniques and materials by a person of average skill in the art.

[0077] The applicant has described the essence of this invention. While this invention has been described with reference to an illustrative embodiment, this description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments as well as other embodiments of the invention will be apparent to a person of average skill in the art upon reference to this description.

Variations

[0079] Due to the simplicity and elegance of the design of this invention designing around it is very difficult if not impossible. Nonetheless many changes may be made to this design without deviating from the spirit of this invention. Examples of such contemplated variations include the following:

1. The shape and size, colors etc of the device or the packaging thereof may be modified.

2. Additional complimentary and complementary functions and features may be added.

3. The system of this invention may be adapted for other related uses.

4. Instead of cylindrical magnets, other types of magnets and mode of mounting on the disk may be employed to create the orbiting, rotational magnetic field.

5. The invention may be scaled up and down by several orders of magnitude

7. An experimental science toy version may be developed for education and entertainment of little young scientists of the future.

8. Homopolar generator may be employed in reverse as a motor to convert electrical energy into mechanical energy.

9. A homopolar servo motor version may be crafted based on this co-rotational magnet and disk concept.

10. Permanent cylindrical magnets may be replaced by equivalent configuration of electromagnets.

11. A portion of the emf generated may be fed back to cylindrical electromagnets to explore the possibility of a self-excited generator without violating any laws of nature.

[0090] Other changes such as aesthetics and substitution of newer materials as they become available, which substantially perform the same function in substantially the same manner with substantially the same result without deviating from the spirit of the invention may be made.

[0091] Following is a listing of the components used in the best mode preferred embodiment and the alternate embodiments for use with OEM as well as retrofit markets. For the ready reference of the reader the reference numerals have been arranged in ascending numerical order.

[0092] 10=Prior art generally

[0093] 20=Rotor(s)

[0094] 21=Axle, rod

[0095] 23=Stationary Ring Stator (Optionally Magnetized)

[0096] 31=Top circular end plate

[0097] 32=Bottom circular end plate

[0098] 33=Bearing

[0099] 34=Central Axle

[0100] 41=Electrically Conductive Thrust Bearing

[0101] 42=Insulating Bearing

[0102] 43=Stationary Hollow Inner Cylinder

[0103] 44=Insulating Bearing

[0104] 45=Opposite Polarity Conductor

[0105] 46=Opposite Polarity Conductor

[0106] 47=Non-Slip Rolling Means

[0107] 48=Non-Slip Rolling Means

[0108] 49=Inner Circular Assembly Plates

Definitions and Acronyms

[0110] A great care has been taken to use words with their conventional dictionary definitions. Following definitions are included here for clarification.

[0111] 3D=Three Dimensional

[0112] Acyclic=Non-cyclic, non rotational or linear

[0113] DC=Direct Current as contrasted from alternating current electricity

[0114] DIY=Do It Yourself

[0115] DYNAMO=A device for converting mechanical energy into electrical energy (& Vice versa)

[0116] EMF=Electromagnetic Force

[0117] Homopolar=Same as unipolar

[0118] Integrated=Combination of two entities to act like one

[0119] Interface=Junction between two dissimilar entities

[0120] N=Magnetic North (Permanent or electro-magnet)

[0121] N-Machine=One Piece Faraday generator

[0122] OEM=Original Equipment Manufacturer

[0123] S=Magnetic South (Permanent or electro-magnet)

[0124] Unipolar=Same as homopolar

[0125] Note: It should be noted that the prior art uses unipolar, homopolar, acyclic and Faraday Disk Dynamo interchangeably.

[0126] While this invention has been described with reference to illustrative embodiments, this

description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments as well as other embodiments of the invention will be apparent to a person of average skill in the art upon reference to this description. It is therefore contemplated that the appended claim(s) cover any such modifications, embodiments as fall within the true scope of this invention as defined by the appended claims.

---

http://myemail.constantcontact.com/Future-Energy-eNews.html?soid=1102230232954&aid=reZ0ThCVt9Y

Morningstar Energy Box

1) Russian Temperature & Magnetic Anomaly Confirmed in Homopolar System

Ed. Note: The Energy Box is based on the Russian multi-rotor orbiting homopolar system US 6,822,361 awarded to Roschin and Godin. A drawing from one of their recent articles, based on the patent, is reproduced above. Sergei Godin is expected to be in attendance at the conference! If you come no other day, Tuesday March 15 is the day not to miss! -- TV

The Morningstar Energy Box (Tuesday, March 15, 4:30 PM) SPESIF-COFE4 Presentation.

Paul A. Murad and Morgan J. Boardman, Morningstar Applied Physics Inc., LLC Vienna, VA 22182
703- 759-2028; Ufoguypaul@yahoo.com
John Brandenburg and Jonathan McCabe, Orbital Technologies Corporation Madison, Wisconsin 53717. Tel:608-827-5000; brandenburgj@orbitec.com

Abstract. The Morningstar Energy Box is a derivative of a Searl device modified in a similar fashion used by the Russian Scientists Godin and Roschin. These devices use laminated rollers and a main ring made of different materials used to enhance electrical and magnetic properties. Where the Searl device uses rollers to move around a main ring, the Russian device kinematically constrains these rollers within a mechanical cage. The operational theory for the Energy Box uses rotating electromagnetic fields to create gravitational effects and is different from those theories outlined by either Searl or the Russians. A prototype device is currently under test and unfortunately self-accelerated motion has yet to be obtained. The Russians have made several serious claims that their device produced self-acceleration to generate electricity, created a relatively large weight loss, generated discrete walls of magnetism far from the device and that a temperature drop exists when the device loses weight. To date, no one has validated these outrageous claims. However, we have found similar phenomenon regarding temperature loss and the discrete magnetic walls to occur during tests of the Energy Box and have correlated the temperature drop that the Godin & Roschin device produces as being a consequence of the Unruh effect. Where they claimed to lose as much as 35% of the weight of a 375 kg armature, the Energy Box only loses as much as 2% of its 490 pounds at this stage of the test cycle. Additional tests and modifications are underway to hopefully increase the weight loss.

For More information see Godin and Roschin original paper in the IRI website, describing their experiments.

http://prlog.org/10549768
Feb 25, 2010

Morningstar Applied Physics Llc

The Morningstar Group is a specialty firm with access to capital and access to cutting edge science using embryonic, newly emerging, and game-changing technologies. These technology ventures will initially focus upon alternative energy approaches.

FOR IMMEDIATE RELEASE

PRLog (Press Release) – Feb 25, 2010 – The Morningstar Group is headed by Paul Murad and Morgan Boardman. They are interested on developing new technologies that will change the way science is currently being pursued. They are looking into paradigm shifting /out-of-the-box technologies that will be game-changers to shape the future. The disciplines include such diverse areas as solar energy, waste management, space propulsion systems, alternative energy, ground propulsion systems, and bio-technologies. These exotic technologies may allow us to be independent of outside energy sources as well as developing alternative ways of dealing with the problems of waste management. Morningstar is a start up company and the principles of the company have over 60 years experience in aerospace and film industries collectively.

Please contact Mr. Paul Richard Price for information at 209-920-4701 or contact Mr. Paul Murad or Mr. Morgan Boardman through the www.morningstarap.com website for further information on this very unusual venture.

The Morningstar Group is a specialty firm with access to capital and access to cutting edge science using embryonic, newly emerging, and game-changing technologies. These technology ventures will initially focus upon alternative energy approaches.

Issued By : Paul Richard Price
Phone : 209-920-4701
606 North 5th Avenue #408
Bozeman Montana 59715
United States

Louis ROTA Levitation Apparatus

http://www.wikirota.org/en/Aero_Radio_Balistique

Aero Radio Balistique

"Le Matin" **(November 15th, 1915)**

Jules Verne In Action

Marseille, 13 September. *From the special correspondent of "Matin*".

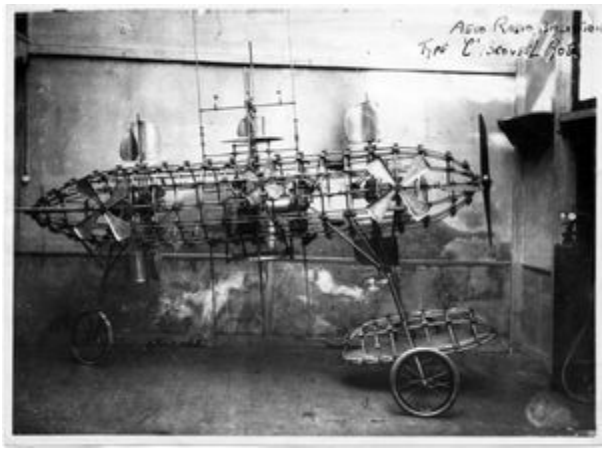
Currently residing in our town an Italian Engineer has made an astounding discovery and that has resolved the problem of holding, absolutely immobile, a body in space.

Professor Louis Rota --- that is his name --- has invented an apparatus which triumphs over the law of gravitation and is able to hold immobile in the air at a height of five hundred, six hundred, indeed 1000 metres, a considerable weight.

It is possible to move this apparatus at a prodigious velocity in any direction and it may be stopped at any point all that, it is understood, without a mechanical motor of any sort, simply by using Hertzian waves.

The principle of this invention rests on the special partitioning of electrostatic and magnetic forces enabling forces of attraction and repulsion sufficient to maintain the apparatus suspended , immobile at a variable height of 400 to 1000 metres for many hours, forty or more. If the wind speed is less than 14 Km/second, the apparatus remains at the same point. In the case that the wind is stronger, the apparatus can rise higher above the wind and remain immobile.

Experiments have already been made which have already given results. The other has been made at Marseille with an apparatus in the form of a cigar 4 metres long and 75 cm diameter weighing 95 kilos. It can lift 45 Kilos and remain 24 hours in the air. It moved 200 Kilometres from its point of departure, and could go from Marseille to Paris (653 kilometres in a direct line) in 3 hours and Paris to Turin (585 Kilometres) in two and a quarter hours.



..

. ...

EDITION E PARIS

e Matin

Mercredi 15 Septembre 1915

RÉDACTION & ADMINISTRATION

TÉLÉPHONE :

MATIN-PARIS

S DERNIERS EXPLOITS DE NOS AVIONS

L'ANGOISSE EFFROYABLE

Au poste de radiotélégraphie

VINGT-HUIT MILLIARD

Ce sera le bilan formidable d'un an et demi de guerre

(Havas.) ALBERT.

Du Jules Verne en action

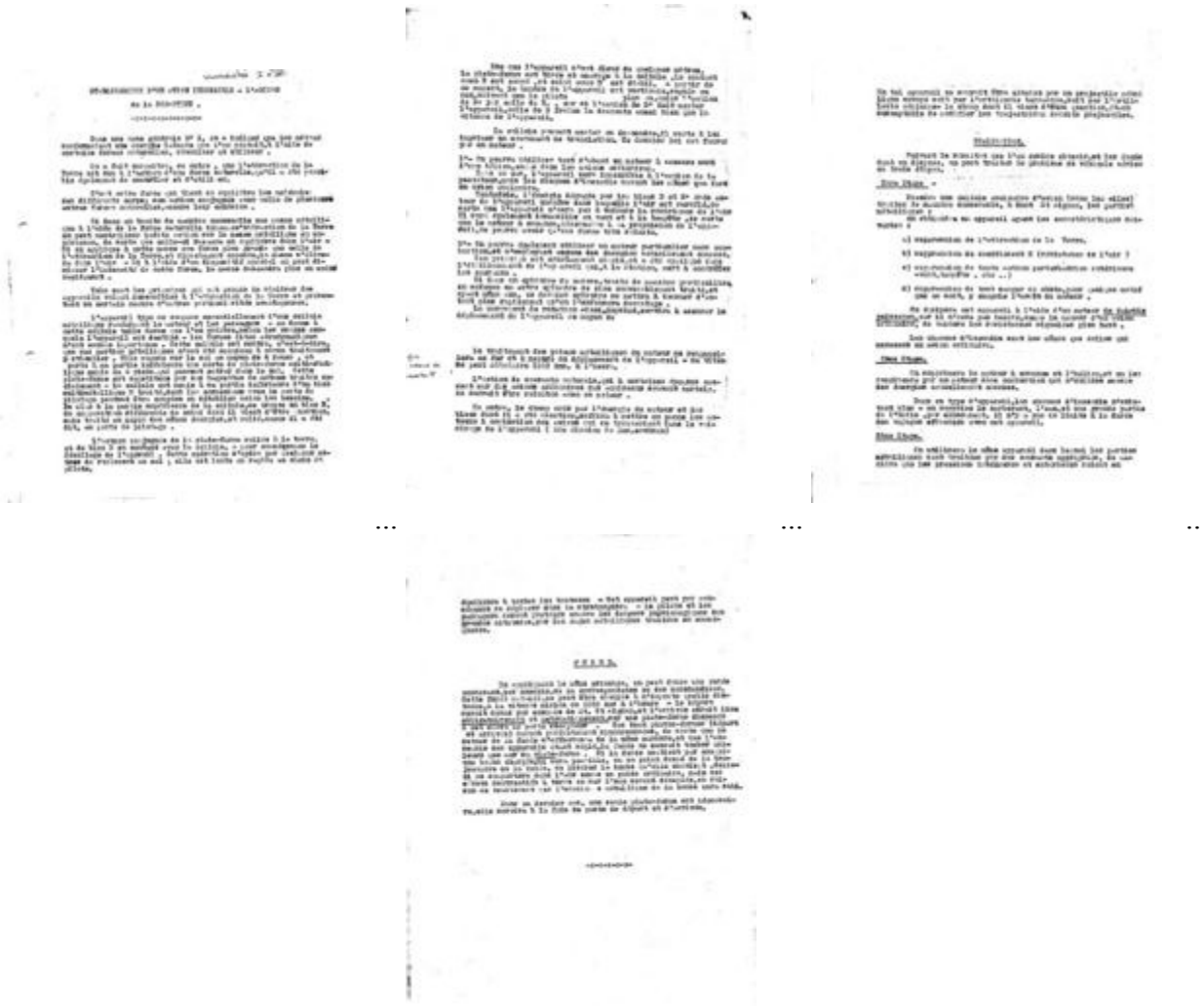
MARSEILLE, 13 septembre. — *Du correspondant particulier du « Matin »*. — Actuellement réside dans notre ville un ingénieur italien qui aurait fait une stupéfiante découverte en résolvant le problème de l'immobilité absolue d'un corps dans l'espace.

Le professeur Louis Rota — c'est son nom, — aurait inventé un appareil qui, triomphant de la loi de la gravitation, pourrait se tenir immobile dans l'air à une hauteur de cinq cents, six cents, voire mille mètres, et serait susceptible de supporter un poids considérable.

On pourrait imprimer à cet appareil une vitesse prodigieuse dans n'importe quelle direction et l'arrêter à n'importe quel point. Tout cela, bien entendu, sans moteur mécanique d'aucune sorte, simplement par l'emploi des ondes hertziennes.

Le principe de cette invention reposerait sur une répartition spéciale des forces électriques et magnétiques, permettant d'obtenir des réactions de répulsion et d'attraction suffisantes pour maintenir l'appareil suspendu, immobile, à une hauteur variant de 400 à 1.000 mètres durant plusieurs heures, quarante au plus. En cas de vent ne dépassant pas quatorze mètres à la seconde, l'appareil reste au même point. En cas de vent plus fort, il se meut dans une direction verticale, monte au-dessus du courant aérien, et reprend son immobilité.

Des expériences ont été faites qui ont déjà donné des résultats. D'autres vont être faites à Marseille même, avec un appareil ayant la forme d'un cigare, long de 4 mètres, avec 75 centimètres de diamètre, et du poids de 95 kilos ; il peut enlever 45 kilos, rester 24 heures dans l'air, se déplacer jusqu'à 200 kilomètres de son point de départ. On pourrait le faire aller de Marseille à Paris (653 kilomètres en ligne directe) en trois heures, et de Paris à Turin (585 kilomètres) en deux heures quarante.



Rota's Note on the Construction "The Aero Radio Ballistique Type C"

Translation

In a previous note I have indicated that metals enclose a latent energy which can, with the aid of certain natural forces, be awakened and utilized.

I make it known furthermore, that the attraction of the earth is due to the action of a certain natural force which it has been possible equally to control and utilize.

This is the force that keeps in equilibrium the molecules of different bodies. Its action along with that of many other natural forces assures their cohesion.

If therefore a metallic mass is treated in a suitable manner with the aid of the natural force which we will call "attraction of the earth", it is possible to neutralize the above mentioned action which the metallic mass experiences, in such a manner that the mass rests in equilibrium in the air. If one applies to said mass a force greater than the attraction of the earth in the opposite direction, the mass will rise in the air. If by means of a special apparatus one diminishes the intensity of said force, the mass will descend more or less rapidly.

Such are the principles which allow the realization of a flying device insensible to the action of the earth and also presents certain number of other advantages.

The apparatus is composed essentially of a closed metallic capsule containing a motor and passengers. The capsule can have any convenient shape, according to the use for which it is required. The form does not have to be aerodynamic, this is of no importance. This capsule is neutral, that is to say the metallic parts of it are not subject to particular treatment. It rests on the ground by means of four wheels and has on the lower part a type of multi-metallic platform carrying four feet which can enter into the ground. The platform is made of metallic strips, specially treated. The capsule is equipped, at its lower part with a treated multi-metallic block B, which has connections to the pilot's controls which can be made or broken as required. Similarly in the upper part of the capsule is placed another block B', which has a different composition to the other, but is treated with the same energies. It is connected to the pilot's controls which can be made or broken as required. The conjugate action of the platform connected to earth and the block B in contact with the capsule cause the apparatus to lift-off . This operation is assisted by rolling a few metres along the ground. It is slow or rapid depending on the choice of the pilot.

When the apparatus has risen some metres the platform is pulled up against the capsule, the contact with the block B is cut and remade to block B'. From this moment the apparatus rises vertically rapidly or not depending on the pilot balancing the action of block B against block B' because the action of B' makes the apparatus rise while that of B brakes the descent as well as the speed of the apparatus.

The capsule can rise or fall, but it still requires a means of producing forward motion. This is done by a motor. A petrol engine and airscrew as in an ordinary aircraft can be used. In this case the aircraft will be weightless but the risk of fire is the same as in ordinary aircraft.

Nevertheless the energy liberated by blocks B and B' create about the apparatus a zone in which the air is rarefied, such that the apparatus will not have to act against air resistance. It will be equally insensitive to wind or storms so that the petrol engine used can be of very much reduced power.

It is equally possible to utilize a special motor, which is without combustion, and does not use known energy. Its principle is extremely simple and is applied in the establishment of the apparatus which at the Station (at Mt St. Aignan) serves to control the currents.

If in a cylinder of copper treated in a special way and enclosing another cylinder of zinc, treated in a special way and mounted on the same axis, the latter cylinder will be caused to revolve more or less rapidly depending on the depth of penetration of one cylinder within the other. The rotation movement furthermore will serve to assure the movement of the apparatus by means of …….. [this part is missing from the originals text]

The treatment of the metallic pieces of the motor is renewed in proportion to the travel of the apparatus, the speed could be as much as 1000Km per hour.

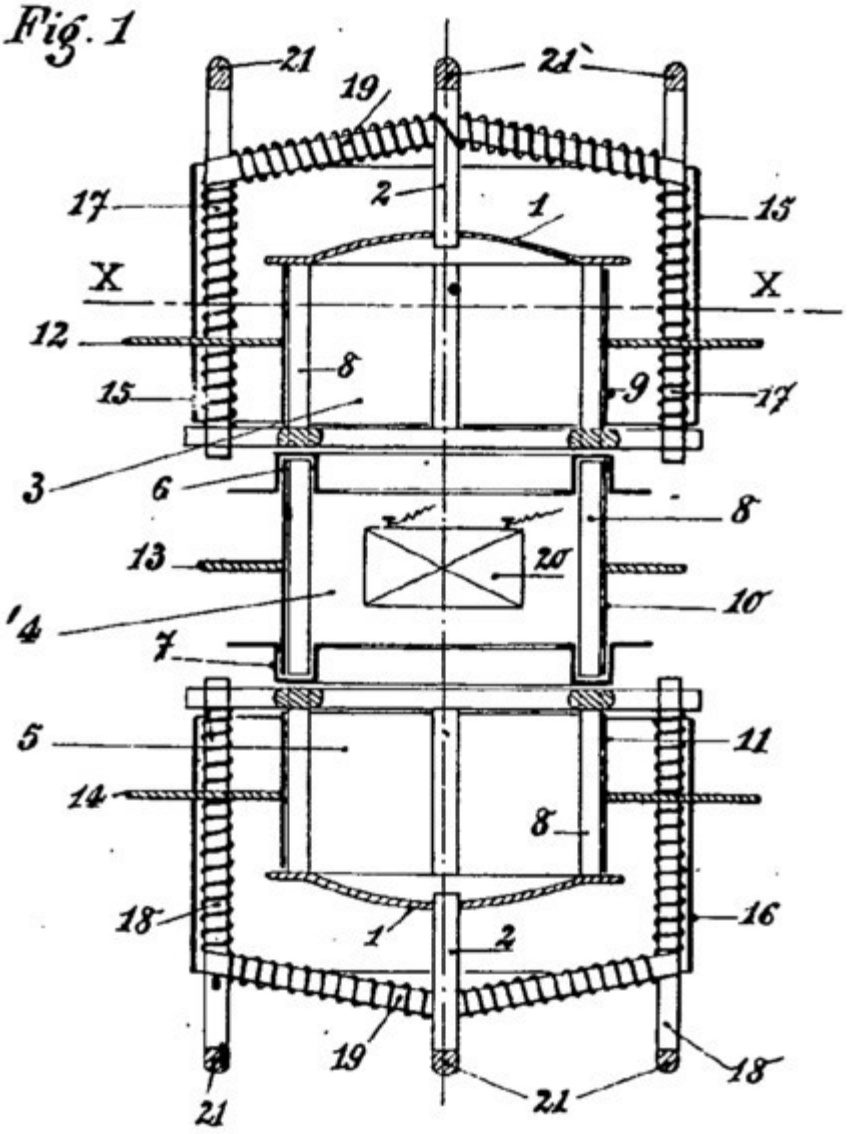
French Patent # 508,472

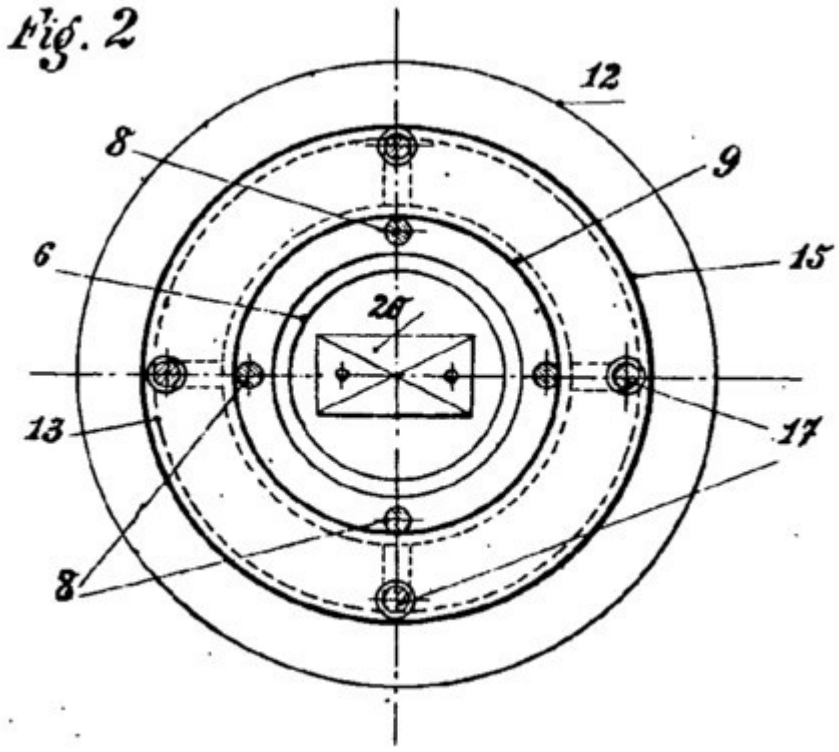
Process and Apparatus to Maintain a Body in Suspension in the Air, Based on the Electric and Magnetic Forces

Louis ROTA & Georges MILIENNE

13 October 1920

Fig. 1


21
21'
19
17
2
1
15
X
X
12
8
9
15
17
3
6
8
13
20
10
4
7
5
11
14
8
18
16
1
2
19
18
21
21



In principle, the invention has for its object an apparatus in which the electric and magnetic forces are distributed under conditions that respond to electrical and magnetic forces of the atmosphere and the earth and the effect of these reactions (repulsions) maintains the unit suspended in the atmosphere or ensure the apparatus falls very slowly.

In the construction of the apparatus, active or active part is performed through metal conductors good of electricity such as silver, copper, iron soft, and so on. while the other pieces are made of wood, aluminum or other lightweight materials.

Drawings in the annex, gave the apparatus cylindrical shape, but it might give any other suitable shape with the purpose of the apparatus.

On this drawing, Fig. 1 shows a elevation of the device with parties cutting and Fig. 2 VUW shows a plan of the aircraft cut by XX in Fig. 1.

The body of the apparatus consists of a vertical closed cylinder with two funds 1, with bells overhead, each of which holds a central rod 2.

The cylinder, at his height, is divided into three sections 3, 4, 5, isolated from one another by insulating rings 6, 7, tip to follow the ends of Part 4, Parts 3 and 5 being similar and arranged symmetrically around the other of Part 4.

The cylinder is constituted by amounts 8, variable number following the magnitude of the device, which support envelopes metallic circles 9, 10, 11 constituted by thin sheet metal disks. These discs are represented in 12, 13, 14.

Concentrically in parts 3 and 5 of the central cylinder and discs 12 and 14, are metallic envelopes 15, 16 in thin sheets of metal maintained by reinforcements 17, 18 linked by 19 to central tie rods 2. Led armatures 17, 18 ties and 19 are led by the son of rolled copper manner has constituent

solenoids, which are powered by a current source of electricity 20, battery or other generators inside the central part 4 of the central cylinder. The current could also come by electrical waves on a wire.

The frames 17 and 18 and central pole 2 are external magnetic masses 21 forming electro-magnets.

In operation, the disc 13 will be the seat of a positive field and discs 12 and 14 will be the seat of a negative field.

Since the electric state of the atmosphere is not stable and can vary, a possibility of change led connections solenoids inducers 17, 18, 19 if necessary, the legal 12 and 14 can be the seat of fields and contrary polarities so that the camera always tells magnetic fields that it is still subject to an attraction from the forces of the electric atmosphere and has a repulsion from the terrestrial magnetism.

John ST.-CLAIR US Patent Applications

Full Body Teleportation System
US2006071122
2006-04-06

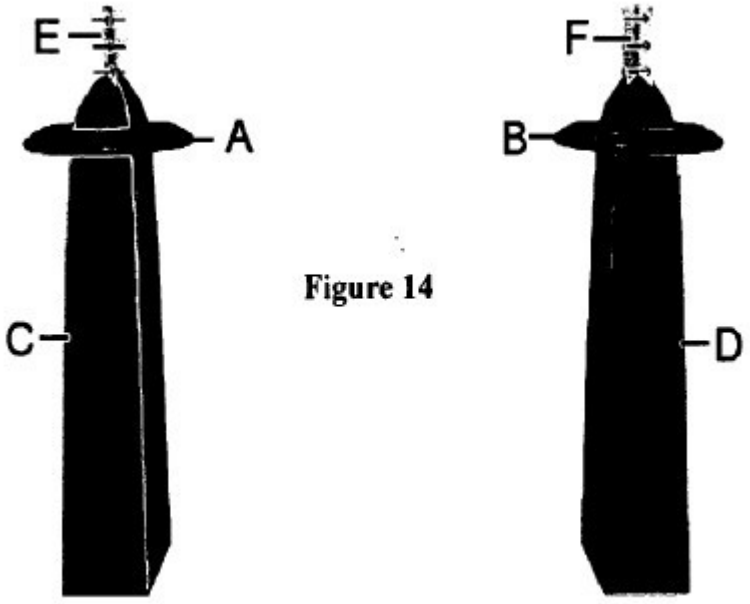


Figure 14

A pulsed gravitational wave wormhole generator system that teleports a human being through hyperspace from one location to another.

Walking Through Walls Training System
US20060014125
2006-01-19

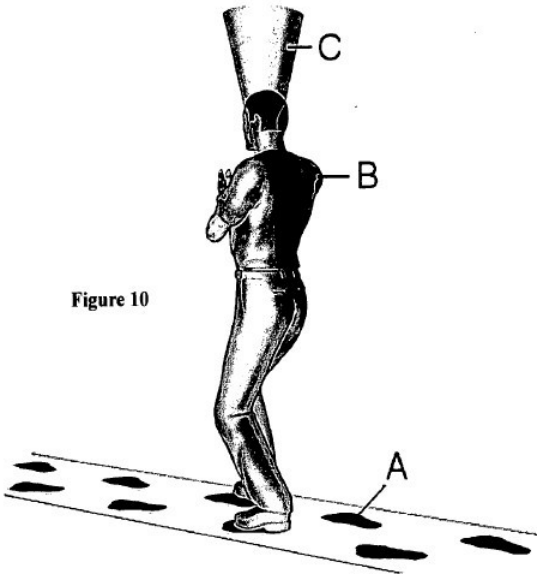


Figure 10

A training system which enables a human being to acquire sufficient hyperspace energy in order to pull the body out of dimension so that the person can walk through solid objects such as wooden doors.

Magnetic Vortex Wormhole Generator
US2003197093
2003-10-23

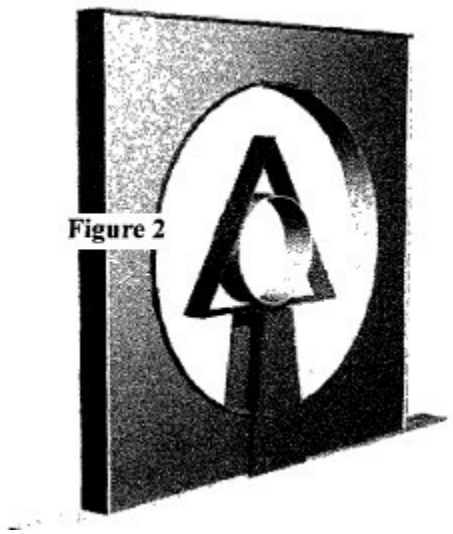


Figure 2

A magnetic vortex generator which has the ability to generate negative mass and a negative spring constant which, according to Einstein's General Theory of Relativity, is required in order to create a stable wormhole between our space and hyperspace. Two separate, but electrically connected, toroidal coils of differing radii, carry magnetic flux in opposite directions about their

common centerline. According to Maxwell's equation, this produces bucking electric fields along said centerline. Because the two solenoids have different radii, the parallel spring constant of both coils is negative. The negative mass together with the negative spring constant produce a real resonant frequency which can distort the spacetime curvature due to the creation of powerful spikes of negative mass. This phenomenon, similar to the common electrical thunderstorm, opens up a wormhole into hyperspace through which low-density hyperspace energy can enter into our dimension. This energy finds many application in new types of power supplies, inertia-less and mass-less spacecraft, vehicles that can travel light-years by moving out of dimension through hyperspace, surgery-less medical tables, cranes for lifting heavy objects, cold-welded crystals for crystal rotors, folding space waveguides, and electromagnetic field propulsion vehicles using highly relativistic fields.

&c...

US2006180473
Water Energy Generator
2006-08-17
USPTO LINK

A water energy generator that generates electricity using a magnetic vortex wormhole generator and a water injector/vacuum chamber to produce low density hyperspace energy that causes the hydrogen atoms of water molecules to decay into electron pairs.

US2004200925
Cavitating Oil Hyperspace Energy Generator
2004-10-14
USPTO-LINK

A hyperspace energy generator that uses cavitating oil bubbles within a magnetic field in order to create wormholes between space and hyperspace for the purpose of permeating the hull of a spacecraft with low-density hyperspace energy.

US2004164824
Hyperspace Energy Generator
2004-08-26
USPTO-LINK

This invention is a braided gold wire coaxial cable of micron size which generates hyperspace energy by coupling to the tetrahedral geometry of subspace, dimension and the Planck mass.

US2004102810
Hyperspace Torque Generator
2004-05-27
USPTO-LINK

A hyperspace torque generator which comprises a flat bifilar magnetic bucking field electrical coil, crystal ball, lever arm and frequency generator for producing a linear flow of hyperspace energy at right angles to a rotating flow of astral chakra energy.

US2003230675
Rotor Inductance Propulsion System
2003-12-18
USPTO-LINK

A spacecraft having a circular, domed hull around which dual electrically-charged rotors one above the other are counter-rotating on the edge of the hull. Embedded in the hull are three solenoids which create a positive vector potential at the rotors. The surface charge density times the radius times the vector potential times the area of the rotors creates an angular momentum in the vertical direction. This angular momentum produces a positive spacetime curvature over the dome of the hull and a negative spiking spacetime compression over the rotors. By machining circumferential grooves of decreasing height along the radius of the rotor, a negative surface inductance is generated. This negative inductance gradient times the negative spacetime compression time the rotor current density squared times the rotor area squared is a positive lift force on the spacecraft.

US2003209636
Bobbin Electromagnetic Field Propulsion Vehicle
2003-11-13
USPTO-LINK

A spacecraft which generates its own magnetic moment and magnetic field gradient in order to produce lift on the hull. The magnetic moment is generated by a large area solenoid located in the hull. A toroidal core wrapped with electrical bobbins at intervals along said core produces a traveling magnetic wave along its surface. This magnetic wave creates a spacetime curvature, similar to a tilted plate, which causes the formation of a magnetic field gradient. Power is not critical because the system uses a magnetic vortex wormhole generator to lower the speed of light in order to efficiently create highly relativistic fields due to Lorentz transformation.

US2003209637
Rotating Electrostatic Propulsion System
2003-11-13
USPTO-LINK

A spacecraft propulsion system utilizing thrusters comprised of a motor-driven electrostatically charged cylinder rotating within an electrostatically charged annular ring for the purpose of creating a spacetime curvature stress-energy tension in the horizontal direction. The thrusters are augmented by magnetic vortex generators, either embedded in the cylinders or located above each thruster, for the purpose of increasing the permittivity of space by permeating each thruster with low density hyperspace energy generated by a wormhole created between our space and hyperspace. A combination of three thrusters mounted on the underside of the hull of the spacecraft provide thrust and yaw motion control.

US2003209635
Electric Dipole Moment Propulsion System
2003-11-13
USPTO-LINK

A spacecraft propulsion system utilizing a rotating octagon of trapezoidal electrically charged flat panels to create an electric dipole moment that generates lift on the hull. On the interior side of each panel are electrostatically charged rods which produce a planar electric field that emerges from holes in the panel to form an ellipsoidal potential energy bubble on the outside of the hull. The rotating hull dipole moment generates a magnetic moment which, together with the magnetic field gradient developed by the rotating electric field of the electrostatically charged panels, produces said lift force. The potential energy field is enhanced by using a double cladding of hull material with different ranges of permittivities.

US2006168937
Magnetic Monopole Spacecraft
2006-08-03
USPTO-LINK

A spacecraft propulsion system that utilizes a dual method of providing lift on the hull by means of magnetic monopoles and electromagnetic spacetime curvature pressure.

US2006144035
Photon Spacecraft
2006-07-06
USPTO-LINK

A spacecraft propulsion system utilizing photon particles to create negative energy over the hull in order to generate a lift force on the hull

US2006145019
Triangular Spacecraft
2006-07-06
USPTO-LINK

A spacecraft having a triangular hull with vertical electrostatic line charges on each corner that produce a horizontal electric field parallel to the sides of the hull. This field, interacting with a plane wave emitted by antennas on the side of the hull, generates a force per volume combining both lift and propulsion.

US2006112848
Permanent Magnet Propulsion System
2006-06-01
USPTO-LINK

A propulsion system for a train that uses permanent magnets mounted on a rotating iron cylindrical plate carrying a radial current in order to create a spacetime curvature distortion which pulls the locomotive along the track.

US2006070371
Electric Dipole Moment Propulsion System
2006-04-06
USPTO-LINK

A spacecraft propulsion system utilizing a rotating octagon of trapezoidal electrically charged flat panels to create an electric dipole moment that generates lift on the hull.

US2006038081
Electric Dipole Spacecraft
2006-02-23
USPTO-LINK

A rotating spacecraft that produces an electric dipole on four rotating spherical conducting domes perturbing a uniform spherical electric field to create a magnetic moment interacting with the gradient of a magnetic field that generates a lift force on the hull.

John R. R. SEARL Searl-Effect Generator

Searl-Effect Generator :
Design & Manufacturing Procedure

by

S. Gunnar Sandberg

(School of Engineering & Applied Sciences, University of Sussex)

June 1985

The objective of this report is to reconstruct the experimental work carried out between 1946 and 1956 by John R. R. Searl that concerns the geometry, materials used, and the manufacturing process of the Sear1-Effect Generator (SEG).

The information given here is based on private communication between the author and Searl and should be considered preliminary as further research and development may give reason to alter and/or update the content.

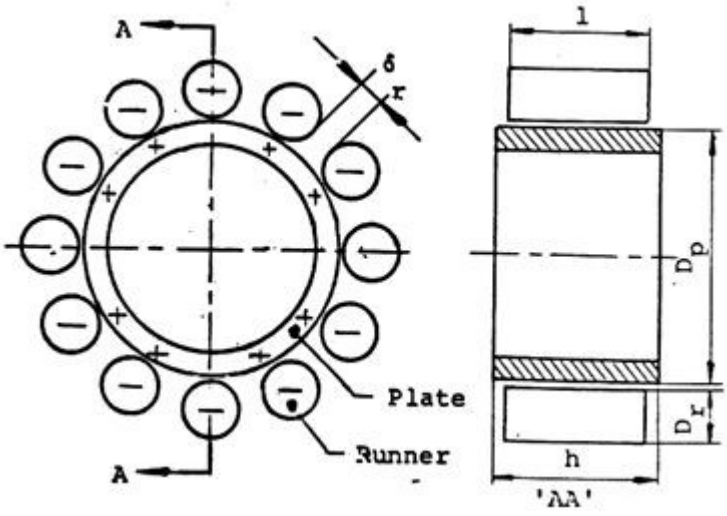
The Gyro-Cell

The SEG consists of a basic drive unit called the Gyro-Cell (GC) and, depending on the application, is either fitted with coils for generation of electricity or with a shaft for transfer of mechanical power. The GC can also be used as a high voltage source. Another and important quality of the GC 1s its ability to levitate.

The GC can be considered as an electric motor entirely consisting of permanent magnets in the shape of cylindrical bars and annular rings.

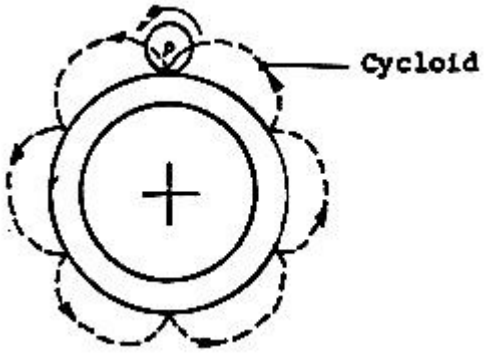
Figure 1 shows the basic GC in its simplest form, consisting of one stationary annular ring-shaped magnet, called the plate, and a number of moving cylinder-shaped rods called runners.

Figure 1



During operation each runner is spinning about its axis and is simultaneously orbiting the plate in such a manner that a fixed point p on the curved runner surface traces out a whole number of cycloids during one revolution round the plate, as shown by the dotted lines in Figure 2.

Figure 2



Measurements have revealed that an electric potential difference is produced in the radial direction between plate and runners; the plate being positively charged and the runners negatively charged, as shown in Figure 1.

In principle, no mechanical constraints are needed to keep the GC together since the runners are electromagnetically coupled to the plate. However, used as a torque producing device, shaft and casing must be fitted to transfer the power produced. Furthermore, in applications where the generator is mounted inside a framework, the runners should be made shorter than the height of the plate to prevent the runners from catching the frame or other parts.

When in operation, gaps are created by electromagnetic interaction and centrifugal forces preventing mechanical and galvanic contact between plate and runners and thereby reducing the friction to negligible values.

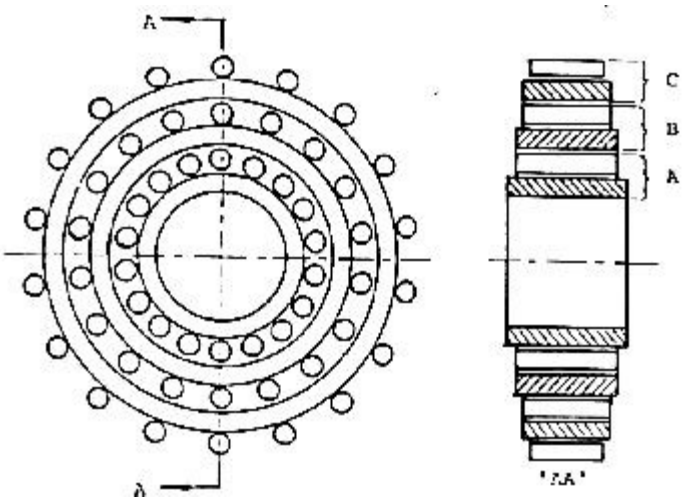
The experiments showed that the power output increases as the number of runners increase and to achieve smooth and even operation the ratio between external plate diameter Dp and runner diameter Dr should be a positive integer greater than or equal to 12. Thus:

(1) $P/D_r = N > 12$ (N = 12, 13, 14, &c)

The experiments also indicated that the gaps O between adjacent runners should be one runner diameter D as shown in Figure 1.

More complex Gyro-Cells can be formed by adding further plates and runners to the basic unit. Figure 3 illustrates a 3-plate GC consisting of three sections, A, B and C. Each section consists of one plate with corresponding runners.

Figure 3



The experiments showed that for stable and smooth operation sections should be of equal weight. Thus:

(2) $W_A = W_B = W_C$

where

W_A = weight of section A,
W_E = weight of section E,
W_C = weight of section C.

The Magnetic Field Configuration

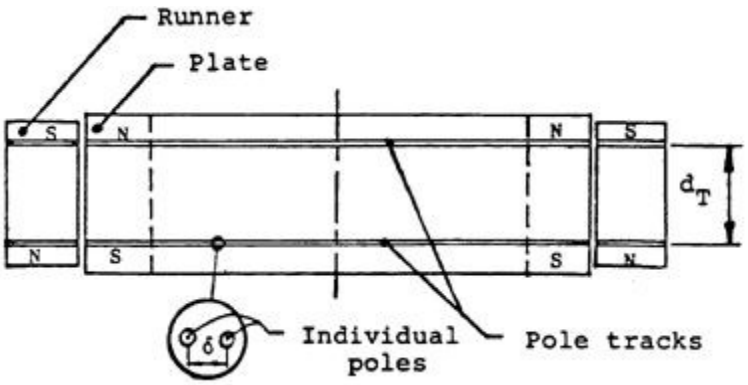
Due to a combined DC and AC magnetising process, each magnet acquires a specific magnetic pole pattern recorded on two tracks consisting of a number of individual N-poles and S-poles, as illustrated in Figure 4.

Magnetic measurements have revealed that the poles are approximately one millimetre across and evenly spaced. It was also found that the pole density (*x*) --- defined as the total number of poles N per track divided by the circumference, pi D --- must be a constant factor specific for a particular generator. Thus:

$x = N_p / 3.14\ D_p = N_r / 3.14\ D_r$

where N_p is the total number of poles per track on plate and N_r is the total number of poles per track on runner.

Figure 4



Furthermore, the distance d_r between the two pole tracks must be the same for all runners and plates which are parts of the same GC.

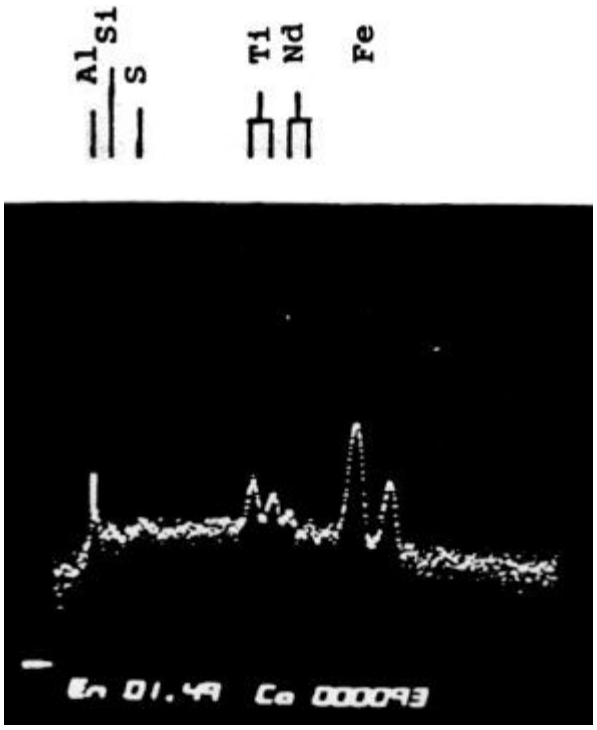
The pole tracks allow automatic commutation to take place and create a turning moment. Exactly how this is achieved is not understood and will require further research efforts.

Likewise, the source of energy is at present unknown. Further research is also needed to establish the exact mathematical relationship between output power, speed, geometry and material parameters, such as mass density and electromagnetic properties of the materials used.

Magnetic Materials

The magnets used in the original experiments were made of a mixture of two types of ferromagnetic powders imported from the USA. One of these magnets, still in existence, has been qualitatively analyzed and was found to contain the following elements: Aluminum, Silicon, Sulfur, Titanium, Neodymium, Iron. The spectrogram is illustrated in figure 5.

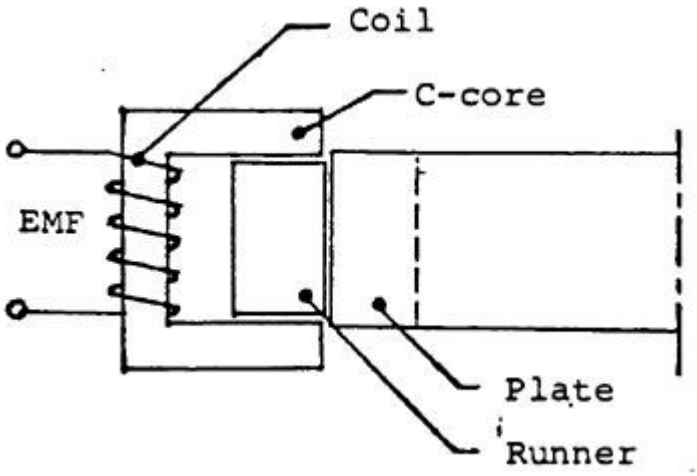
Figure 5



The Induction Coils

If the SEG is sued as an electrical power plant a number of induction coils must be fitted to the GC. The coils consist of C-shaped cores made of soft steel (Swedish steel) or high u-ferrite (mu-metal). The number of turns and wire gauge used depends on the application. Figure 6 shows the basic design.

Figure 6



Manufacturing Procedure

The block diagram in Figure 7 illustrates the main stages in the manufacturing process.

Figure 7

(1) Selection of Magnetic Materials >> (2) Weighing >> (3) Mixing >>
(4) Moulding >> (5) Machining >> (6) Inspection > (7) Magnetization >>
(8) Inspection >> (9) Assembly >> (10) Final Control.

Stage 1: Magnetic Materials & Bonding Agents

It is feasible that future research will reveal other magnetic raw materials to be cheaper and/or more efficient than the ones used in the original experiments. It is also possible that other types of binder may improve the performance.

Stage 2: Weighing

In general, to produce efficient magnets the right amount of each element contained in the ferromagnetic powder is crucial. It is therefore reasonable to suggest that when mixing different types of powders an optimal weight ratio does exist that will produce a 'best' magnet.

At present, however, this weight ratio is not known for the powders used by Searl in his past experiments. Together with new magnetic materials and optimization of generator geometry, this is an area in which research efforts could be profitable.

In general, the amount of binder used should be as small as possible to achieve maximum mass density of bonded magnets. However, the possibility that the binder is taking an active part in the generation of the Searl-Effect must not be excluded. For instance, the dielectric properties of the binder may play an active role in the electromagnetic interactions taking place in the SEG. If that is the case, then a further amount of bonding material may be beneficial.

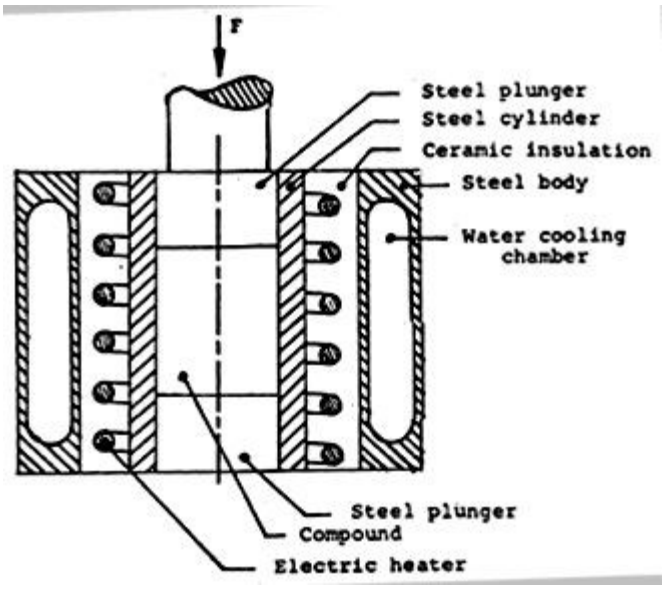
Stage 3: Mixing

The mixing is an important process which will decide the homogenity and reliability of the finished product. A homogeneous mixture can be achieved by using turbulent air flow inside the mixing container The experiments did show that an improved performance was achieved if all magnets for the same generator were made from the same batch.

Stage 4: Moulding

During the moulding process the compound- consisting of ferromagnetic powders. and thermoplastic binder is compressed and simultaneously cured by heating. Figure 8 illustrates the tool used for making 'blinds'. A 'blind' is an unmagnetized runner or plate/part of plate. When manufacturing large plates (D_p > 30 cm) it may be necessary to make them in segments rather than in one piece.

Figure 8



The figures given below should be considered as guidelines only, since correct data are not available regarding the influence of the moulding process on the Searl-Effect.

1. Pressure: 200-400 bars
2. Temperature: 150 C-200 C
3. Compression time: > 20 minutes.

Before releasing the pressure the mould must be allowed to cool.

Stage 5: Machining

This process can be bypassed if the weighing and moulding procedures are carried out correctly. However, it may be necessary to polish the cylindrical surface of runners and plates.

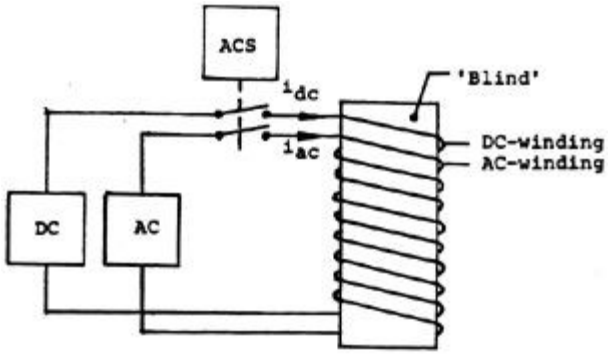
Stage 6: Inspection

Control of dimensions and surface finish.

Stage 7: Magnetization

Runners and plates are individually magnetized in a combined DC and AC-field during one on-off duty cycle. Figure 9 illustrates the magnetizing circuit.

Figure 9



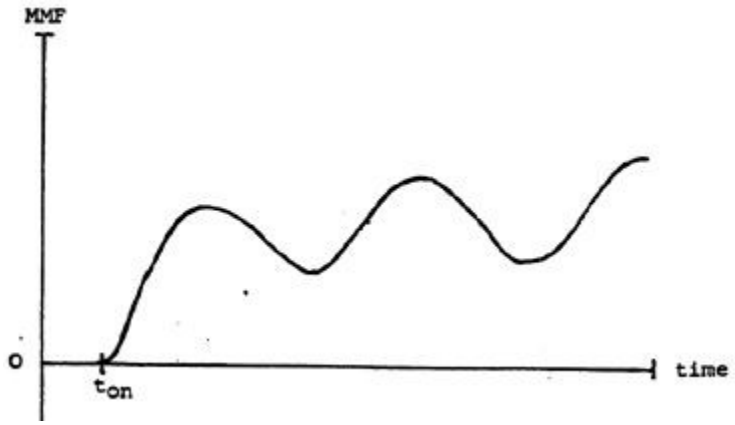
The function of the automatic control switch (ACS) is to simultaneously switch on the DC-current, i_{dc} and the AC current, i_{ac} at such a time, $t = t_{on}$, that the instantaneous value of the total magnetomotive force (MMF) is always positive. Thus:

$MMF = i_{dc}N_1 + i_{ac}N_2 \geq 0$

Where N_1 is the number of turns in the DC-winding and N_2 is the number of turns in the AC winding.

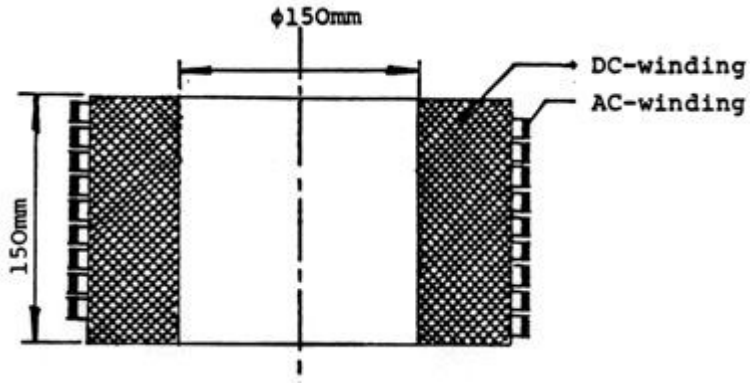
Figure 10 shows the total MMF as a function of time.

Figure 10



The magnetization coil consists of a DC winding containing approximately 200 turns of heavy copper wire and an AC winding containing approximately 10 turns of copper strip wound on top of the DC winding. Figure 11 shows a cross-section of the coil and its dimensions.

Figure 11



Recommended parameter values:

DC current, i_{dc} = 150 A to 180 A

AC current, i_{ac} = 0.1 to 0.2 A

Frequency, f = 1-3 MHz

Stage 8: Inspection

The purpose of this control is to test for the existence of and the correct spacing of the two pole tracks. The measurements can be made with a magnetic flux density meter in combination with a set of control magnets.

Stage 9: Assembling

The assembling procedure depends on the application. Used as a mechanical drive unit, the magnets must be mounted inside a framework and fitted to a drive shaft. Used as an electric power plant, induction coils must be fitted to the framework.

The Searl Effect & The Searl-Effect Generator

(Reconstruction of the experimental work carried out by John Searl between 1946 and 1952 concerning the claimed discovery of a new source of energy)

by

S. Gunnar Sandberg

(17 June 1987)

Preface

Introduction
The Manufacturing Procedure of the Permanent Magnets
The Magnetising Equipment used by Searl
A Novel Magnetising Method
Generator Geometry
The Discovery of the Searl-Effect & Invention of the Searl-Effect Generator
The 3-Ring Generator & the Searl-Levity Disc

Appendix A: Analysis of the Searl-Magnet
Appendix A2: Additional Tests & Measurements on the Searl Magnet

---

Preface

This report is based on a series of interviews given by John R.R. Searl on a number of occasions since 1982 and contains information and data concerning the experimental work on permanent magnets carried out by him between 1946 and 1952. The experiments resulted in the claimed discovery of a new source of energy, the so-called Searl-Effect (SE) and the invention of a new permanent magnet machine, the so-called Searl-Effect Generator (SEG) to utilize this effect. The report also contains data and information regarding important tests and measurements made on the SEG, or part thereof, by Searl in cooperation with other research workers after the aforementioned time period.

It must be stressed that all documentation describing the experimental procedures and the equipment used was destroyed by fire in 1983. It is therefore not possible to give a detailed and accurate account of Searl's work.

Nevertheless, the information gathered is believed to contain enough data to allow a successful repetition of the experiments to be made.

The reconstruction of the equipment used has been a joint effort between Searl and the author, in particular the magnetizing coil and the switching equipment.

S. Gunnar Sandberg
(June 1987)

Introduction

In 1946, at the age of fourteen, John Roy Robert Searl began his employment as a trainee at the Midland Electricity Board (MEB) in Birmingham to become an electrical and electronics fitter. The MEB produced their own permanent magnets to be used in the manufacturing of energy-meters and other electrical instruments. This work was carried out in the electronics workshop where Searl was a trainee. Soon, Searl became involved in the production of permanent magnets and gradually learned the manufacturing procedures and how to use tools and the necessary equipment. Also, the management gave him permission to use the research laboratory for his experiments which were considered to be part of his training. It was in this environment Searl began his experimental work on permanent magnets that eventually culminated with the discovery of a new magnetic effect.

Searl's original idea was that free electrons in spinning metal bodies may have a tendency to move in the radial direction due to inertial forces. If this hypothesis was correct then an electric potential difference should develop between the center and periphery of a rotating shaft and between the inner edge and the rim of a slip ring. He also held the view that the electromotive force induced in spinning bodies due to the earth's magnetic field could be used for generating electric energy. Accordingly, Searl's first series of experiments consisted of careful measurements on fast rotating steel shafts and slip rings made of brass and indeed he was able to show the existence of a minute electric voltage in the radial direction. If this voltage was due to the inertial properties of the electrons or induced by the magnetic field of the earth was never established. However, it soon became evident that this simple generator would only be practically useful if means could be found to increase the power output.

At this stage in the experimental work any person with a formal education in electrical engineering would have considered the principle unworkable and the effect an academic curiosity without practical applications. However, Searl was not so easily discouraged and began experiments with rotating permanent magnets manufactured by him using a magnetic material(l) made by Mullard UK and later using magnetic alloys imported from the USA. These alloys proved to be superior compared with the magnetic material manufactured by Mullard (Whether or not this material was a ferromagnetic alloy or a ferrite s not known). The use of permanent magnet material resulted in a considerable improvement and by now Searl was convinced that this simple principle could be used to generate electricity. Whether Searl's choice of magnetic materials was a deliberate experimental strategy or a coincidence is not known, but in due course the use of these materials did lead to unexpected effects.

The Manufacturing Procedure of the Permanent Magnets Used by Searl

During the early part of his training period Searl manufactured a great number of permanent magnets in the shapes of cylindrical bars, hollow cylinders, annular rings and rectangular rods. The magnets were moulded by pressing a mixture of magnetic powder and a bonding agent. For this operation a hydraulic press with appropriate press tools was used. The work was carried out inside a vacuum chamber to prevent explosion. Moulds made of bakelite were also used and the mixture of magnetic powder and binder was packed by hand into the bakelite mould and the whole assembly placed into the vacuum chamber with the intention of removing the air from the mixture and increasing the mass density of the magnets. However, this method was less efficient than using the hydraulic press which produced better and denser magnets. The curing of the moulded cores could sometimes take as long as three days. This suggests that curing took place at room temperature and a liquid binder was used. In later experiments Searl successfully used nylon (thermoplastic) with an excess of negative charges. These charges appear to have taken an active part in the production of the Searl effect.

Two types of magnetic alloys and bonding agents were imported from the USA by Searl. This material was paid for by George Haynes of Turner Street, West Bromwich, who financially supported Searl's experimental work between 1946 and 1948; the reason being that Mr. Haynes' son and Searl made the experiments together.

A magnet produced in 1946 by a mixture of the two alloys was analyzed qualitatively in 1984 and found to contain the following elements: Aluminium, Silicon, Sulphur, Titanium, Neodymium, Iron.

The precautions taken by Searl when handling the highly flammable element neodymium and details concerning the moulding process have never been properly investigated. Likewise, the identities of the American suppliers of the magnetic alloys have not yet been established.

Further information regarding the magnet specimen is found in Appendix A.

The Magnetising Equipment Used by Searl

The coil used by Searl to magnetise the moulded cores was originally intended for and used to demagnetise (degaussing) turbine shafts and generator shafts and consisted of approximately 200 turns of heavy electric copper wire normally used for connecting electric cookers to the mains. The magnetising current used was 180 amperes and supplied by a Westinghouse three-phase mercury rectifier. The on-off switching operation was carried out manually using a high current switch and the on-off duty cycle lasted for seconds rather than fractions of a second. More information regarding the coil can be found in the report SEG-002.

A Novel Magnetising Method

Based on what can only be described as intuition, Searl suggested that a second winding should be added to the existing magnetizing DC-coil and connected to an AC-source. This proposition created heated discussions amongst his fellow workers as to the effect of such a magnetising method. The general view was that the magnetic field created by an alternating current would partly cancel the magnetic field created by the direct current and make the coil less efficient. However, Searl suggested that the existing RF-signal generator in the laboratory should be used as an AC-source; this would prevent cancellation of the DC-field. This idea was met with an even greater scepticism as the current supplied by the signal generator would be minute and have insignificant effect on the magnetising process. Searl persisted, however, with his views and eventually succeeded in winning his manager's approval for the idea. Searl can remember his manager carrying out certain calculations concerning the design of the AC-winding. These calculations were at the time beyond Searl's comprehension and no information is any longer available regarding their nature. The exact number of turns in the AC-winding remains unknown despite a considerable effort on Searl's part to recall the details concerning the coil. However, based on fundamental electrical engineering it can be assumed that the calculations involved resonance (to maximize the number of ampere-turns in the AC winding, parallel resonance should be used) and characteristic impedance determinations with the intention of avoiding shorting out the signal generator. It is, therefore, reasonable to suggest that these calculations can be repeated and a reconstruction of the AC-winding can be made.

The switching equipment consisted of two hand-operated switches which had been mechanically interlocked; one switch for the DC-current and the other switch for the AC-current.

Generator Geometry

Exactly when Searl decided to use the 'roller bearing' geometry as a model for his generators is not known and will require further investigation. However, it must have been very early in his career, probably as early as 1946. The inertial and the gyroscopic effects of a fast spinning ball-race intrigued him and Searl used to release fast rotating ball-races and study their behaviour when they dissipated the kinetic energy through collisions with surrounding objects. It was most certainly the result of these experiments that inspired him to use this configuration for his generators.

The Discovery of the Searl-Effect and the Invention of the Searl-Effect Generator

Equipped with these new ideas concerning geometry and magnetizing methods, Searl started to make generators consisting of a single annular ring surrounded bya number of rollers. By keeping the ring stationary and forcing the rollers to spin about their own axis and simultaneously revolve around the ring by driving them with an electric motor, the generators produced voltages in excess of 30 kilovolts. However, it was not always that Searl was successful in producing such high voltages. Since he did not know the mechanism responsible for the effect, it was very much a matter of trial and error to reproduce the magnets. Sometimes the failure rate was very high, seventy percent or more; out of a batch of a hundred (100) magnets only thirty (30) would work. The reason for this was never established with certainty, but it is believed to have been caused by the primitive switching equipment used.

The Searl-Effect

At a certain critical speed some of the generators would suddenly lock in to a mode of operation that appeared to be some kind of positive feedback and they would run spontaneously without any mechanical connection to the driving motor. In the beginning Searl could not control this effect at all.

Later, he found that by loading the generators electrically it was possible to reduce the speed, but once this state of operation had been reached the generators could not be stopped. However, it is possible that if appropriate test equipment had been available Searl would have been able to bring the generators to a halt by loading them either electrically or mechanically. It must be pointed out that Searl did not have the financial support required to carry out such comprehensive and dangerous tests and even if he had access to the workshops and the laboratory at the MEB, where such tests could have been made, he was certainly not allowed to carry out dangerous experiments on the MEB's premises.

As the experimental work progressed Searl succeeded in reducing the critical speed to a value close to zero by a careful design and by increasing the number of rollers, and eventually he was able to produce a generator that was self starting. Searl discovered that when the generators were running the air pressure decreased in the immediate vicinity of and inside the generators. At voltages above thirty kilovolts the air motion was directed away from the rim of the generators, and candle light that had been placed at the centre of the generator ring went out due to lack of oxygen. This decrease of the air pressure could explain the absence of flashover between the ring and the rollers. Searl also discovered that the temperature dropped considerably close to and in the interior of the generators, probably due to the transport of air away from the generator. Another interesting effect was that objects placed inside the generator ring lost their weight. The existence of these effects were later confirmed by use of proper measuring equipment.

The Searl-Effect Generator

Three different systems were developed to extract the energy produced by the SEG; one mechanical system and two electrical:

(1) The mechanical system: The details concerning the mechanical drive system are not known and are yet to be investigated.

(2) The high voltage system: This system was originally developed for measuring the electric potential difference generated between the stationary ring and the moving rollers. The positive generator terminal was fitted to the ring and the negative terminal consisted of a number of parallel-connected comb-shaped electrodes mounted around the generator periphery and in close proximity to the rollers, as shown in Figure 1.

(3) The low voltage system: By fitting a number of stationary c-shaped induction coils around the rim of the generator, as shown in Figure 2, and connecting them in series or parallel, or a combination of both, the SEG produced electric power of its own ($\sim 10^2$ watts).

Several small generators of this type were manufactured and by 1952 Searl had built the first multi-ring generator.

Figure 1

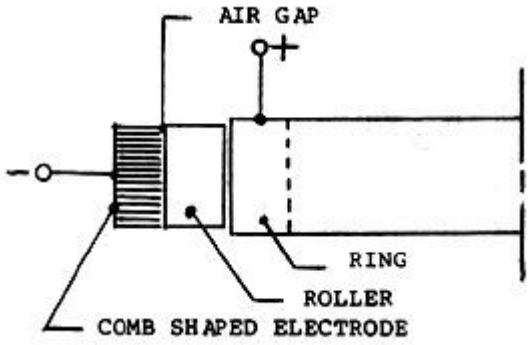
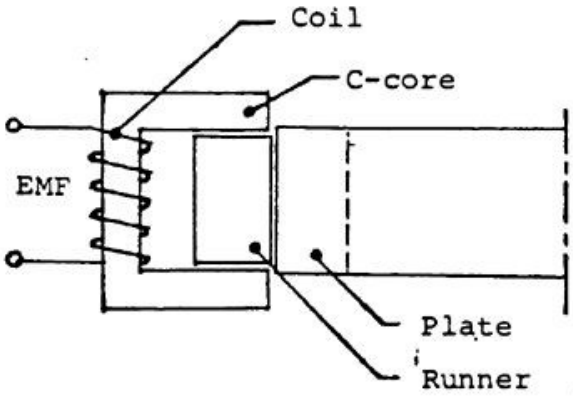


Figure 2



The 3-Ring Generator & the Searl-Levity Disc

This device was about three feet in diameter and consisted of three segmented rings in the same plane, with a number of induction coils at its periphery (Details regarding this device can be found in the report SEG-001, October 1982). Each ring consisted of a number of magnetic segments with insulating spacers between each such magnet. Due to high cost, this generator did not contain enough roller-magnets to be self-starting.

The generator was tested by Searl and a friend of his in the open and the armature was set in motion by a small engine. The device produced an unexpectedly high electrostatic potential in the radial direction. At relatively low armature speeds a very high voltage was produced and indicated by static effects on nearby objects. Characteristic crackling and the smell of ozone supported the conclusion.

The unexpected then occurred. The generator lifted while still speeding up, broke the union between itself and the engine, and rose to an altitude of about 50 feet. Here it stayed for a while, still speeding up and surrounded itself in a pink halo. This indicated ionization of the air at a much-reduced pressure.

Another interesting side effect caused local radio receivers to go on of their own accord. This could have been due to ionizing discharge or electromagnetic induction. Finally, the whole generator accelerated at a fantastic rate and is believed to have gone off into space.

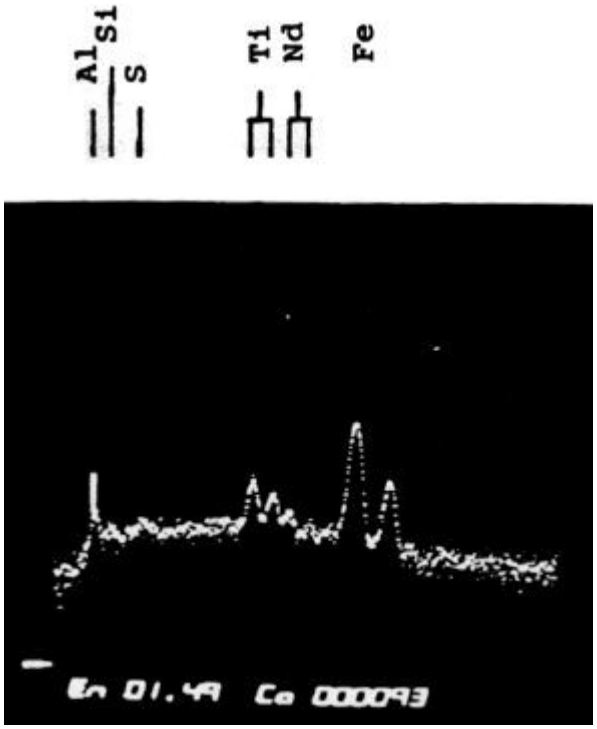
Since 1952, Searl and his co-workers have manufactured and tested more than 10 generators, the largest being a 10-meter disc-shaped craft, the so-called Searl-Levity Disc (SLD). Figure 3 shows a smaller version of the SLD.

Figure 3: Searl Levity Disc [Not available]

Appendix A: Analysis of the Searl-Magnet

The magnet specimen supplied by Searl was analyzed by Roger Cheese (a material science technician at the School of Engineering & Applied Sciences, Univ. of Sussex)) on April 16, 1984, using Energy Dispersive X-Ray Analysis, the so-called EDAX-spectrum, and found to contain the following constituent elements, as shown in Figure Al.

Figure A1: EDAX-Spectrum



The EDAX-spectrum also contains information concerning the quantity of each constituent element.

Although this data is inadequate for an exact quantitative analysis, it is considered accurate enough for an acceptable estimation to be made. This work will require expertise and financial support.

According to information received from Dr. Anthony Simpson(a retired materials scientist and a former lecturer in the School of engineering & Applied Sciences, Univ. of Susses) the element neodymium was most certainly included to reduce the oxygen content and prevent it from having an adverse effect on the magnetic properties of the alloy. There is the possibility that the

neodymium was a contamination but that is less likely. In either case the percentage neodymium was probably less than 10% by weight (5% by weight is most likely).

The dimensions and the magnetic polarity of the magnet specimen on which the tests were carried out are shown in Figure A2.

Figure A2: Dimensions in mm

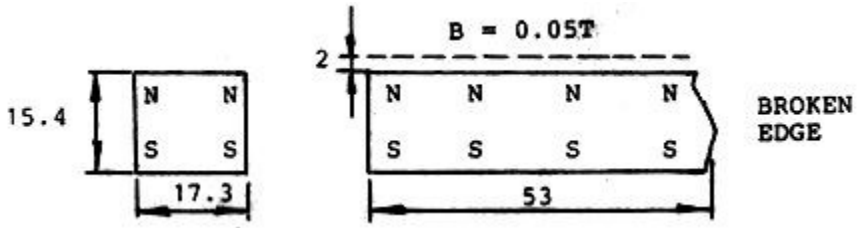
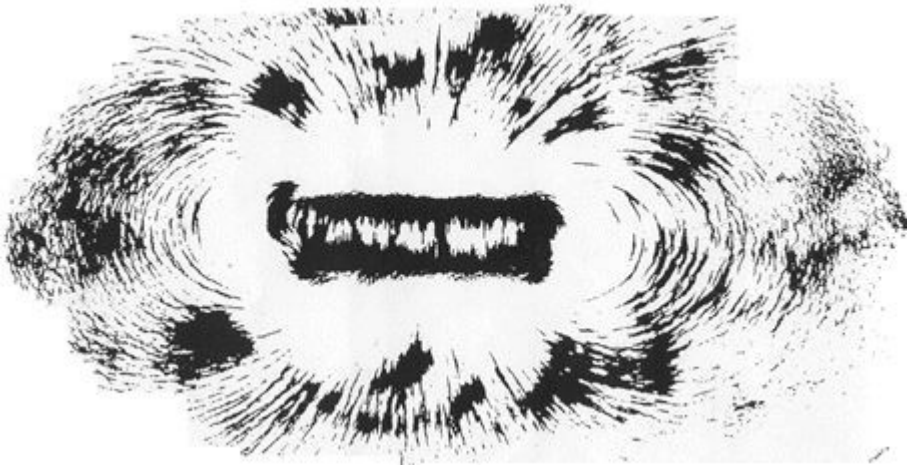


Figure A3 shows the magnetic flux pattern obtained by use of iron filings. The magnet was identical to one of the bar magnets demonstrated by Searl on August 15, 1982, as shown in the report SEG-001. At the time of testing (April 1984) the magnet had been accidentically broken during transport.

Figure A3: Magnetic Flux Pattern



Appendix A2: Additional Tests & Measurements on the Searl Magnet

The magnetic flux density, measured approximately two mm from the pole faces (Figure A2), was 0.05 Tesla or 500 gauss using a standard magnetic flux density meter with Hall-Effect probe (Magnetometer D11, Scientifica & Cook Ltd, London)

The existence of the "recorded" pole pattern could not be confirmed using the aforementioned flux density meter. Such tests would have required a more sensitive instrument.

Other physical parameters:

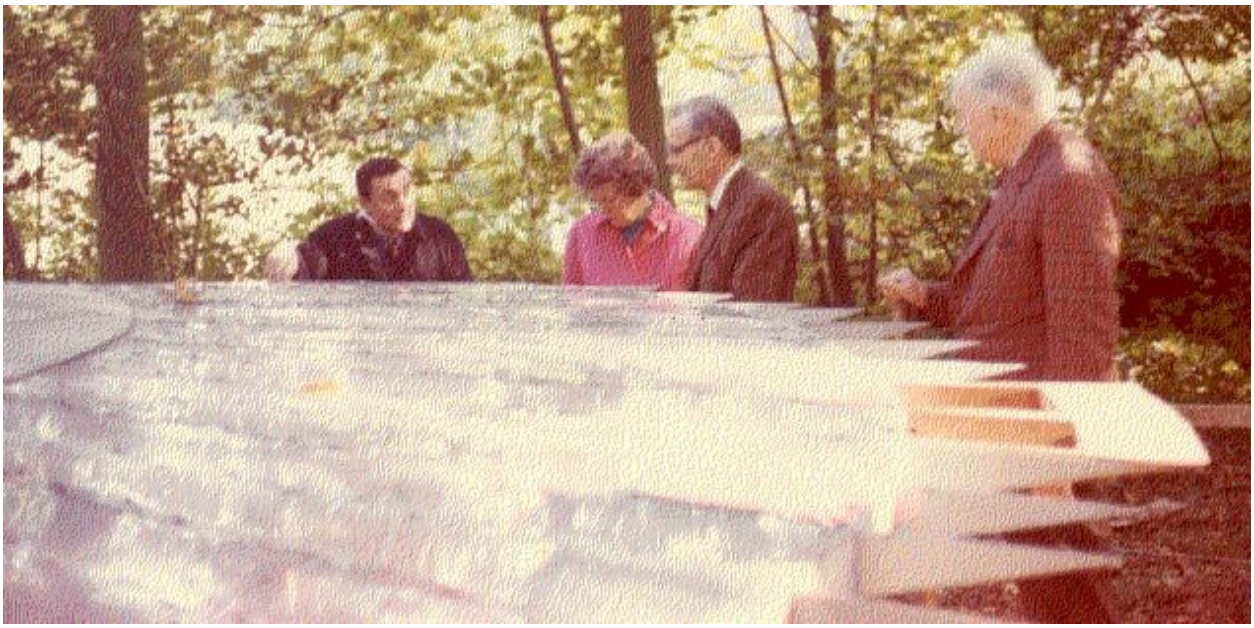
Total weight: 67.6 gr
Total volume: 14.1 cm3
Mass density: 4.79 g/cm

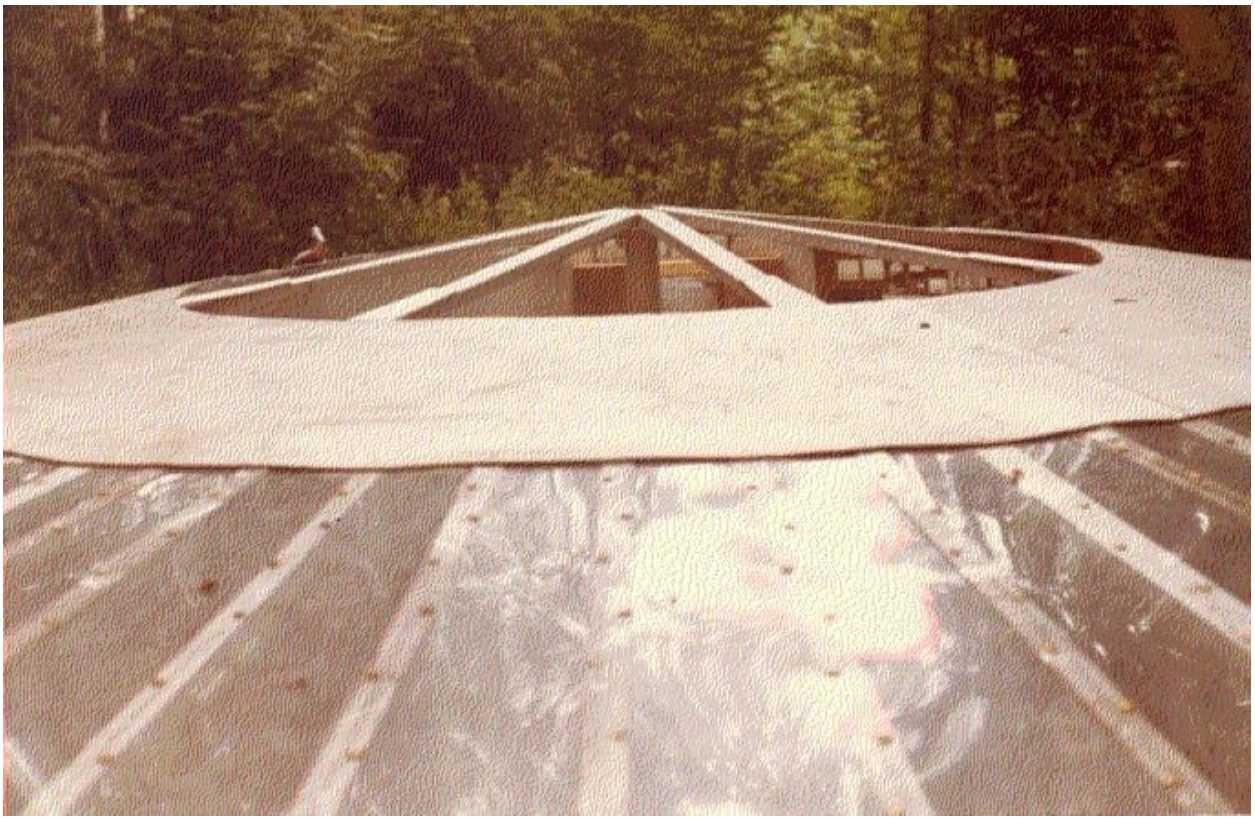
Figures A4 and A5 show two electron micrographs revealing the surface structure of the sample used for analysis at magnifications of X1000 and X4400 respectively. [Not available]

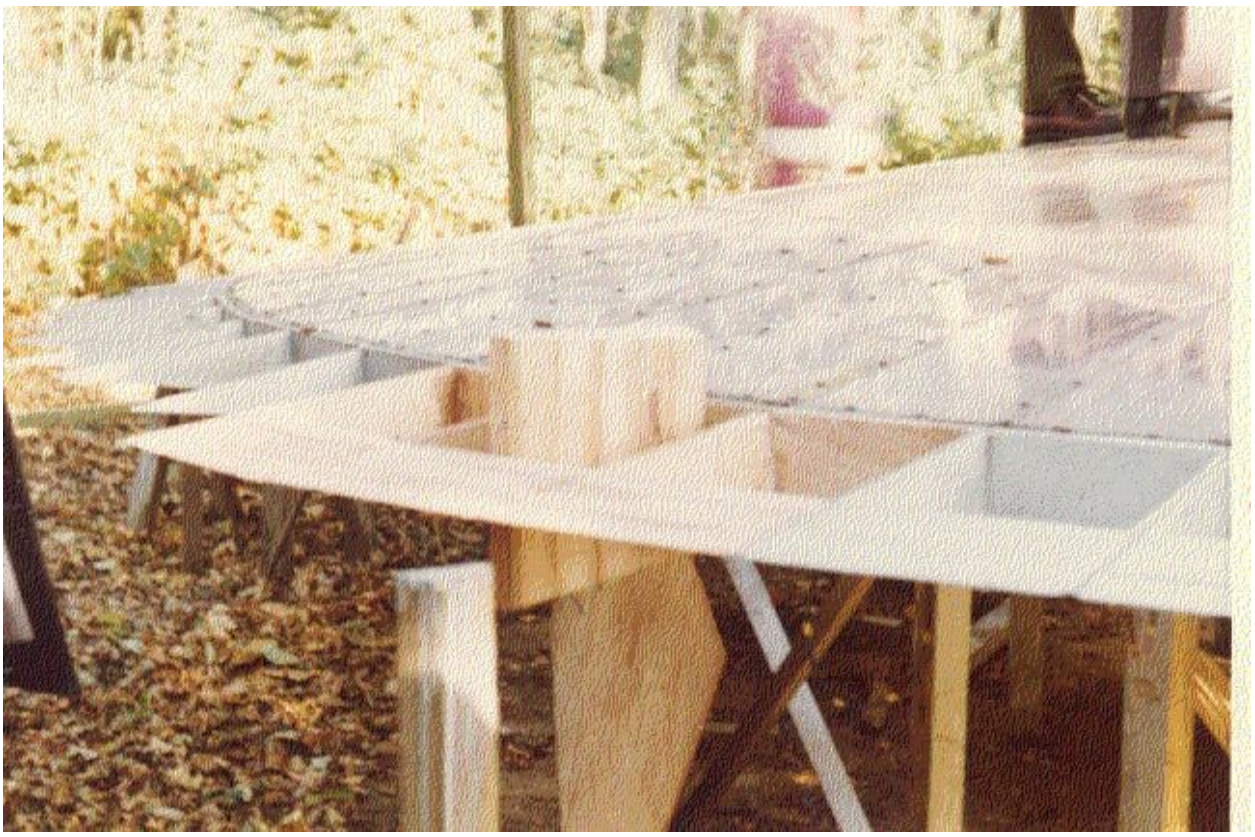
At the time of testing (April 1984), lack of funds and other duties prevented additional important measurements from being made. The magnet was therefore returned to Searl with the intention of borrowing it at a future date for further investigation. However, upon later request the author was informed by Searl that all magnets in his possession had been lost.

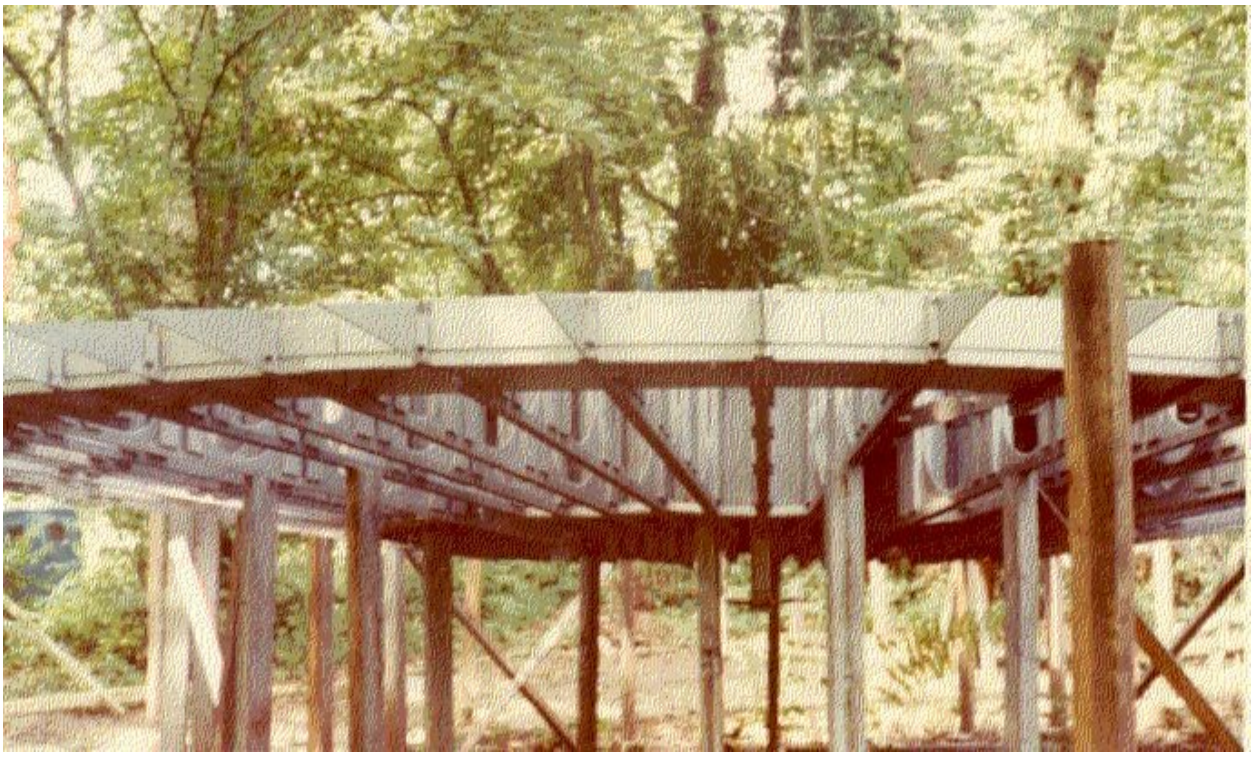
John R. SEARL Levitation Disc Photos

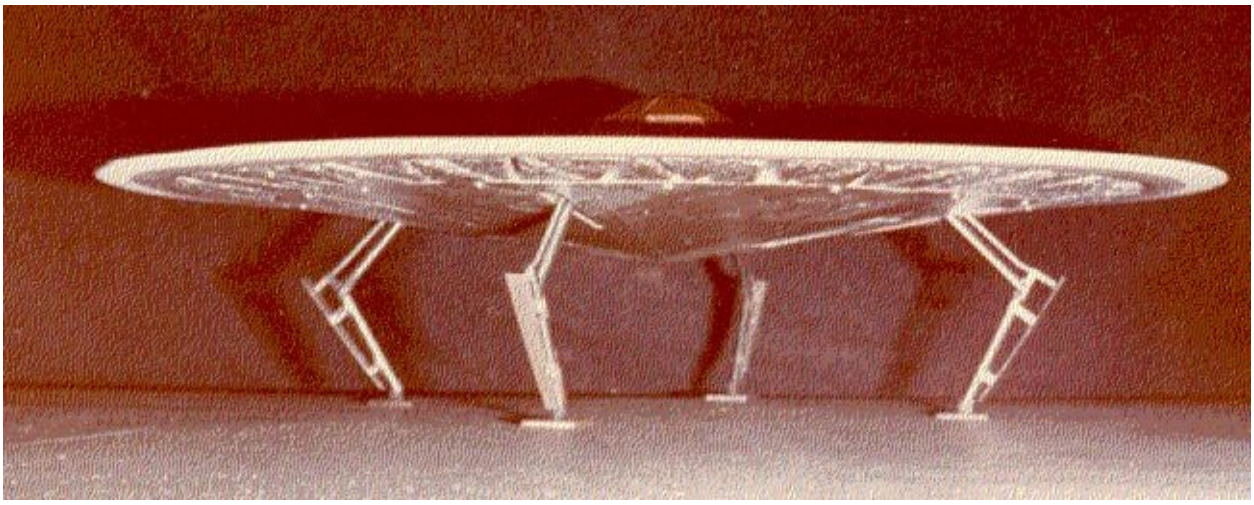
I was Searl's "Superintendent of Documents" for a while in the late 1960s. Here are some rare photos of his attempt to construct a "Levity Disc" in the woods of Sussex in the early 60s. Also shown are photos of a model that he used to generate fake composite photos (with the help of a newspaper photographer) to illustrate some newspaper articles of the period. This is not to imply that Searl is a fraud. His work was replicated recently by Roshcin & Godin. Unfortunately for Searl, he has been suppressed by his government and others, but he may yet be vindicated.

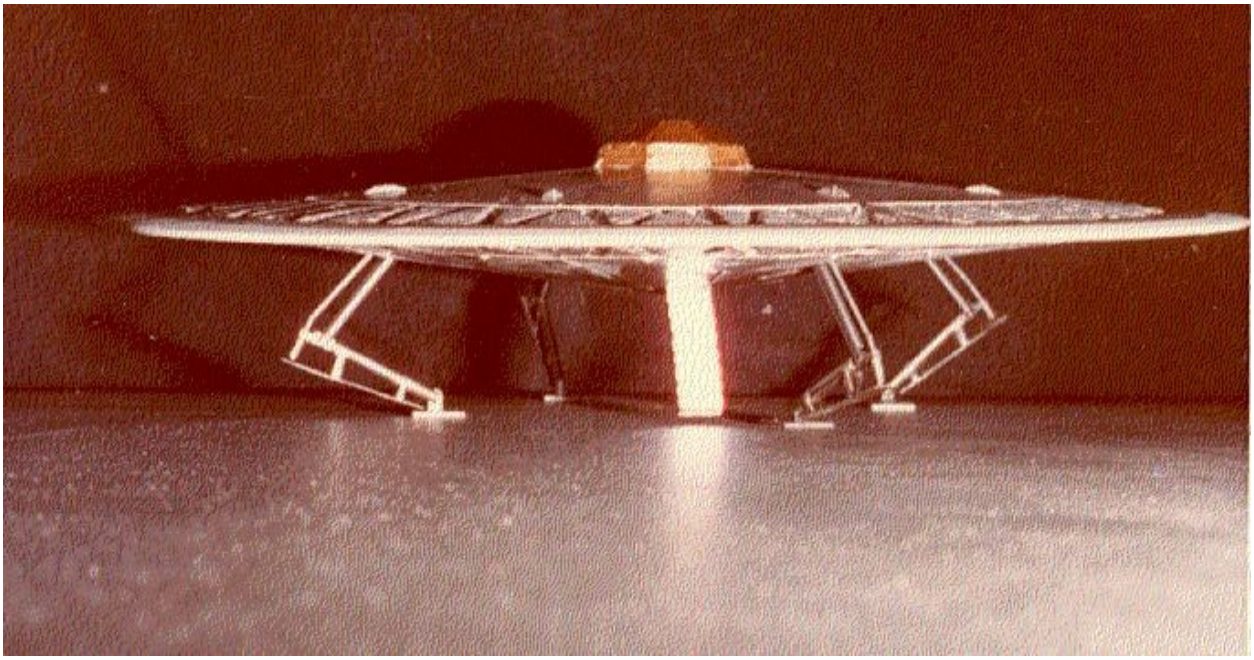


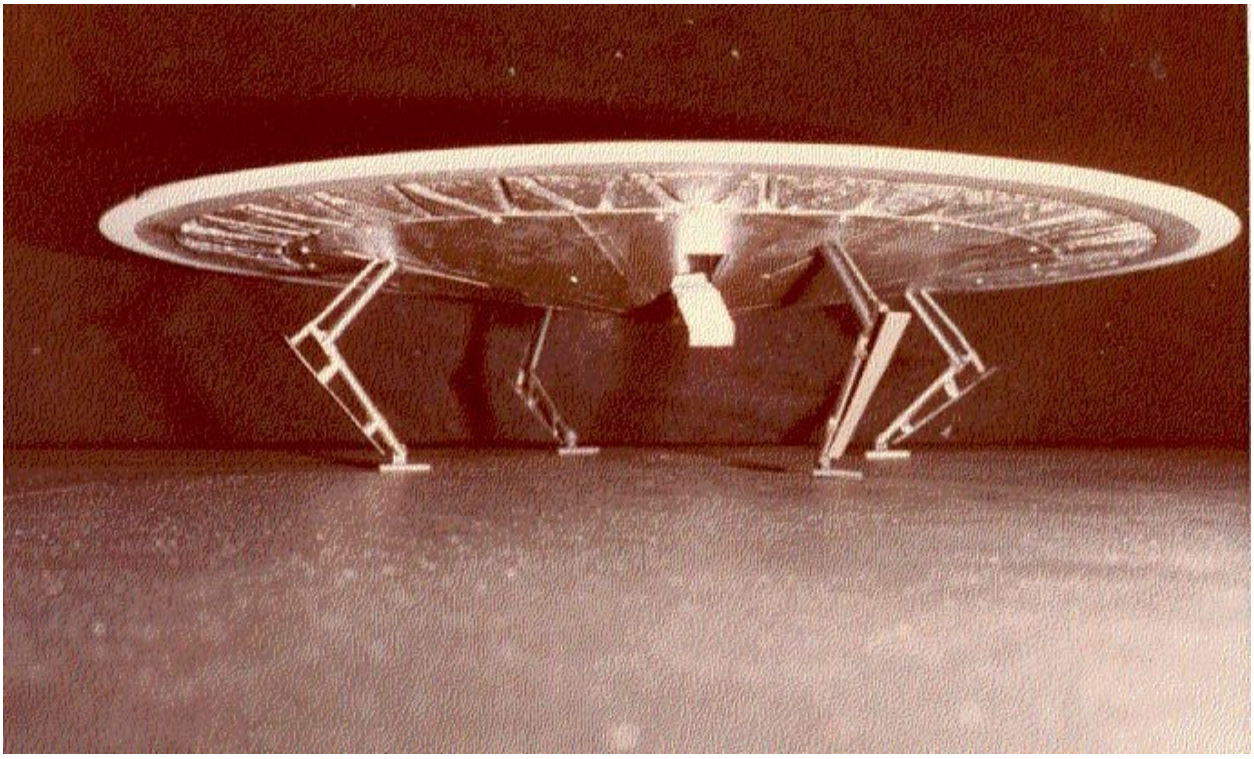


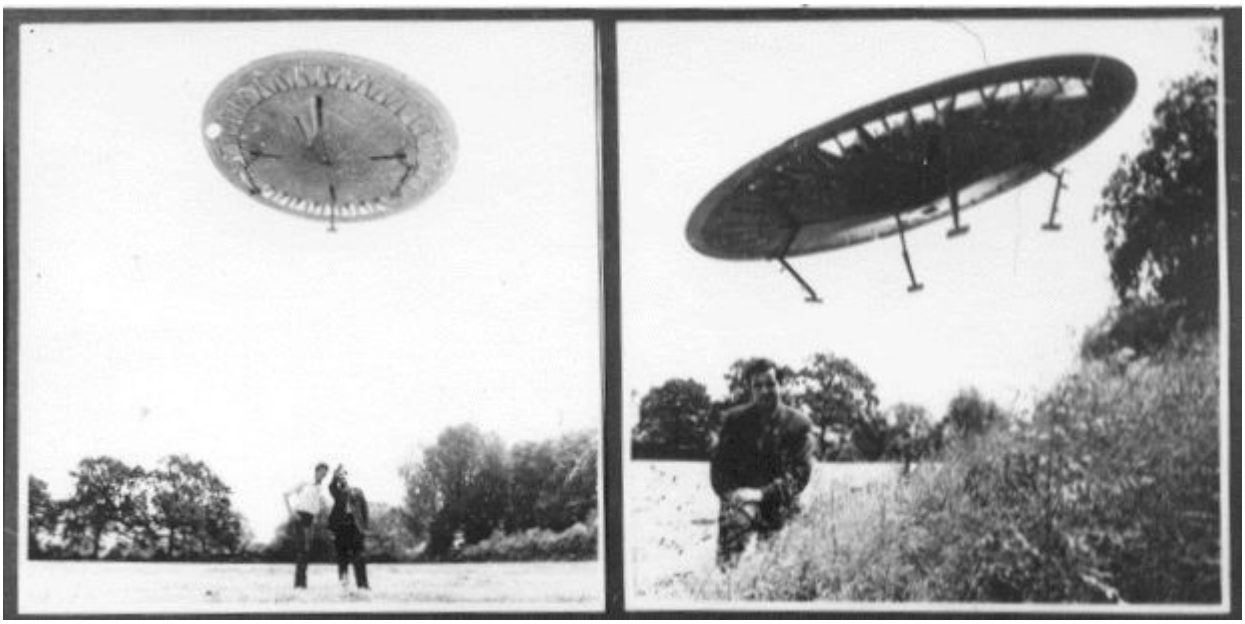












New Energy Technologies, **Vol. 10 (1), Jan.-Feb. 2003, p. 47**

[Excerpted from www.sisrc.com]

Background

The Searl Effect Generator (SEG) technology, as applied to the commercial market, had been previously developed to the point where a few prototype SEG generators were made, and used for electricity generation and motion. Commercial interest at that time focused on the SEG's transport potential and, under commercial pressure to deliver a fully functional system, the original generators were used and lost in a series of vehicular propulsion experiments and demonstrations. Funding was insufficient to continue with the manufacture of the required larger-scale pressurized cabin machines --- resulting in the termination of the project at that time.

Although all the operating principles, precise proportions and weights of the required materials are known for three of the four required operating materials, the precise data of the original magnetic layer is uncertain. The objective of the current R&D programme s to re-establish the original magnetic layer using modern and more efficient materials.

Originally, the layered materials were constructed and magnetized by the now-defunct Midlands Electricity board under the direction of John Searl.

Modern magnetic materials have advanced considerably, and old ones discontinued, so a series of tests need to be conducted to establish the optimum materials and processes, These tests need to comply with the working criteria required and must lead to a cost-effective manufacturing process.

In recent times SISRC has been re-establishing the original research. Due to the very limited funding that has been available, only a partially functioning demonstration prototype of the SEG principles has been possible. This prototype consists of the innermost of the three composite tings required and several rollers…

Technical Description

Physically the Searl Effect Generator (SEG) consists of three concentric rings each made of a composite of four different materials which are also concentrically attached to each other. The three rings are fixed to rotate around them, are rollers --- typically 10 on the first ring, 25 on the next, and 35 on the outer ring. Surrounding the rollers on the outer ring are coils which are connected in various configurations to supply either AC or DC current at a variety of voltages. Multiple magnetic poles are imprinted on the rings and rollers to form frictionless magnetic bearings. These also arrange the static charge into opposing charge clusters which cause the rollers to rotate around the circumference of the ring (as shown in Figure 2)

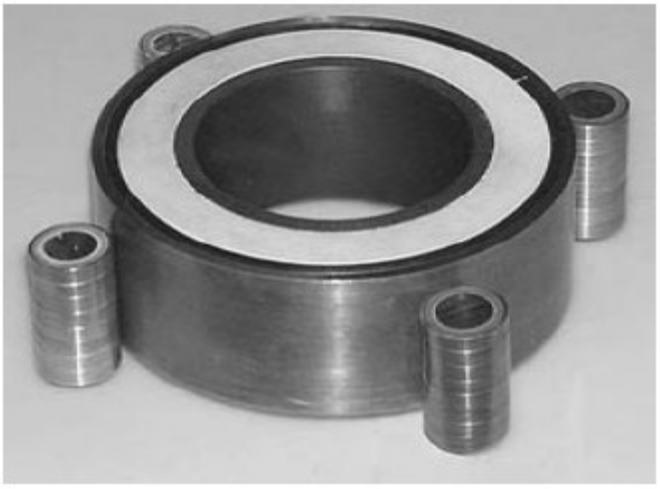


Fig.1
Experimental ring and rollers

Fig. 2
15 KWt Searl Effect Generator (SEG)

Some expressions currently in use to describe the source of the energy for the SEG are the Space Fabric, Quantum Energy Field of Space, or Zero Point Energy. This is an unlimited and constant source of energy which can be made to flow when the correctly proportioned masses concerned are stimulated by the correct frequencies creating an ‘open system’.

The idea of utilizing this source of energy is currently the subject o various devices and experiments such as the ‘Lamb Shift’, ‘Casimir Effect’, and the work of the Russian Nobel Prize

winner Ilya Prigogine. However, these devices and experiments tend only to prove the existence of energy and not a method to create a coherent, ordered flow to produce useful power.

In contrast, John Searl has discovered that, in order to create a steady and stable flow, all the masses of the device (and the stimulating frequencies) must conform to precise values determined mathematically by the 'Law of the Squares'. A machine constructed to these principles produces a stable and useful power output.

Definition of a Surface-Operating SEG

A linear motor operating on a magnetic bearing with the characteristics of an auto-transformer. The SEG is defined as a device, which is constructed from 2,124 component parts, which make up 3 plates and 66 roller sets. 12 of the 2,124 components create the 3 plates, which act as reaction components. 2,112 components are employed to create 66 roller sets, which act as active components. Each roller set consists of 8 segments constructed from 32 components. Each segment cannot be less than 34 grams in weight, as the law of squares defines that value as the lowest value suitable for the reasonable generation of electricity. Therefore the smallest roller set must weigh 272 grams, making a grand total of 2,244 grams per roller set for the smallest surface-bound SEG.

Tolerance should be about 0.05 gram per roller set. The larger the error the greater is the loss of power within the unit. Therefore the total tolerance for the smallest SEG roller set must not be greater than 3.30 grams --- above this factor the SEG will not function. For the best results, the tolerance across the total 66 roller sets should not exceed 0.05 grams!

The SEG is a step-up rotary transformer. In fact it's a 'three rotary transformers' operational system, within a unit. The inner transformer output is fed in to the input of the second plate which increases the output of the second unit, thereby increasing its final output to a very high voltage. Therefore the SEG is just a prime mover for the production of clean electrical energy. The output windings must be designed to step down this output to 240 volts at 15 Kwatts…

When the SEG rollers are brought into close proximity to the SEG Ring, te Searl Effect resonant magnetic field causes negative ions and electrons to be drawn into and accelerated through the machine. This process is assisted by the highly electron-attracting rare earth metal Neodymium.

The unique mechanical and material arrangement of the SEG pulses the neodymium to continually release and replace the surplus electrons to provide electrical or mechanical power, or both.

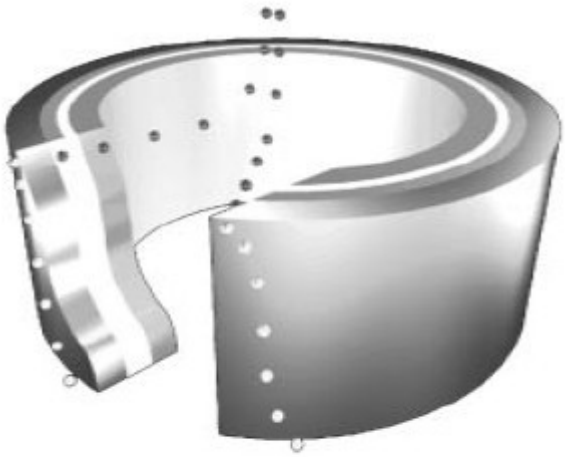


Fig.3

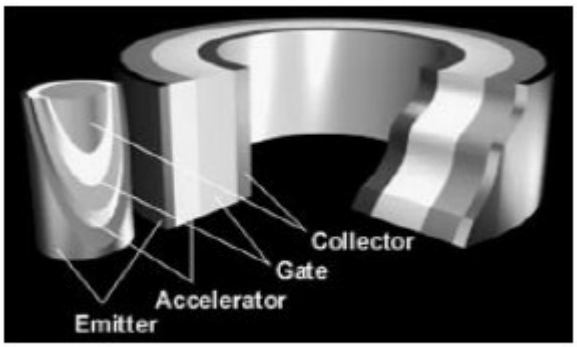


Fig.4

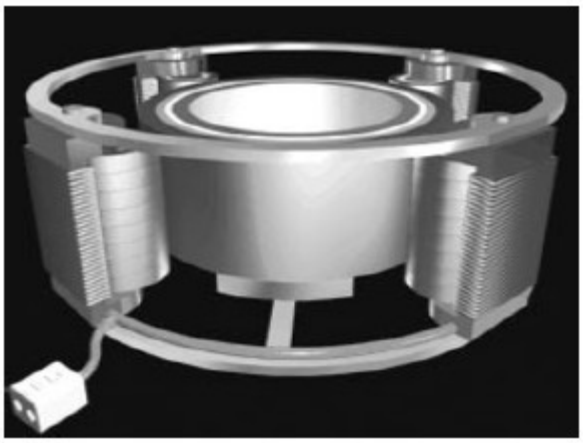


Fig. 5
Demonstration ring and rollers

Development

Prior to the production of complete 15 KW SEGs, a minimum of two demonstration Ring and Roller prototypes are to be produced.

The ‘Ring’ is typical of the innermost of the three rings required to make a complete SEG. The 69-roller sets in a complete 3-ring SEG are identical. Six roller sets will be made for the prototype inner rings so that the Searl Effect can be demonstrated.

The production of a self-running Ring and Roller prototype will establish the precise sequence and parameters of electrical, magnetizing and material processes required for the SEG and will demonstrate electrical power generation. An operating single inner ring with 1-8 rollers will also determine if a particular material will function correctly and at what level of power output…

Open Source Energy network
http://www.opensourceenergy.org
Video Link: http://www.opensourceenergy.org/_layouts/apps/vplayer2.asp?vID=24
(IFNE Conference, Denver CO, 1994)

www.searleffect.com

NOTES

"The Searl Effect Generator (SEG) is a magnetic diode, and what one may consider one of the original "Free Energy" Devices. The inventor of the technology is Professor John Robert Roy Searl of England. The SEG in essence is a composite ring made of an electron reservoir (a rare earth like Neodymium), a magnetized accelerator stage (Iron or Nickel), an electron flow regulator stage (Nylon 66 or Teflon), and finally, a paramagnetic layer (Aluminium or Copper). The design of the SEG is both beautifully simple and infuriatingly complex at the same time..."

"Inside each of these IGVs there is a powerful 3-ring SEG which provides levity to the craft through a combination of magnetic, electrostatic and flywheel effects, many of which I freely admit are beyond my comprehension.

"The iron element in the SEG "plate" (the big ring) is magnetized with a combined DC and AC magnetizing sequence which causes many poles to form all over the surface of the iron, in a wave like pattern corresponding to the AC frequency used. The iron element is then combined with the others (which are NOT involved in the magnetizing process) in a process called sintering - pushing them together under pressure. The same is done for the smaller magnets, or "rollers", except that each roller consists of eight stacked segments held together by the magnetic field. When you have twelve roller stacks and a correctly magnetized plate, and place the rollers on the plate as below, something truly amazing happens.

"There are only ten rollers in the picture for safety reasons, as in a full set, the rollers will accelerate to 250km/h around the plate! This incredible feat is due to the instability of having an AC sine imprint on the plate and a cosine print on the rollers - instability created as the fields conflict causes the rollers to orbit the plate. They are held down by the magnetic field and thrown out by the centrifugal forces, so the rollers do not actually touch the plate when in motion. Thus, friction is virtually non-existent, and the high electrostatic charge accumulated by the SEG soon ionises all the nearby air and pushes it totally away from the SEG, enveloping it in an intense vacuum. High voltage flashover thus becomes impossible, and the potentials created by the generator can reach monstrous levels.

"Unlike any other form of electrical technology, the presence of electron flow throught the generator actually cools it, reducing the resistance. This is due to free electrons being pulled out of the air and the resulting energy deficit causing the air to cool. As one places a greater and greater load on the SEG's induction coils (fitted so that the rollers pass through them to produce high-frequency AC), the rollers accelerate to accomodate the added energy drain, more power is pulled from the air, and the temperature lowers even further. A critical point is eventually reached. At 4 degrees Kelvin, the SEG superconducts and totally loses all electrical resistance. At this point, it levitates, completely enveloped in a perfect vacuum. Without control, it will accelerate up away from the Earth and disappear off into space, never to be seen again. To control it, a powerful radio frequency emitted nearby is required. If the same RF is transmitted as the AC frequency used to magnetise the rollers, they will completely stop. This acts as an ideal control gate, preventing the loss of costly generators.

John SEARL Levitation Disc – Articles

P.L. Barrett
The Searl Effect
***SNSRC Newsletter* (1 June 1968)**

1: barrett1a.jpg

2: barrett1b.jpg

3: barrett1c.jpg

4: barrett1d.jpg

5: barrett1e.jpg

6: barrett1f.jpg

7: barrett1g.jpg

8: barrett1h.jpg

9: barrett1i.jpg

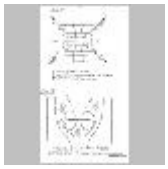
10: barrett1j.jpg

11: barrett1k.jpg

12: barrett1l.jpg

13: barrett1m.jpg

14: barrett1n.jpg


15: barrett1o.jpg

Shinichi Seike
Introduction to the Theory of the Searl Levity Disc
***SNSRC Newsletter* (1 June 1971)**

1. seike1a.jpg 2.seike1b.jpg 3. seike1c.jpg 4.

seike1d.jpg 5. seike1e.jpg

Notes

1. notes1.jpg 2. notes2a.jpg 3._blank notes2b.jpg 4.

notes3.jpg 4. notes4.jpg

John Bigelow (Frogstein)

1. frogstn1a.jpg 2. frogstn1b.jpg 3. frogstn1c.jpg 4.

frogstn1d.jpg

Bernhard Vaegs
A Discussion of the Searl Disc on the Basis of My Knowledge of Scientific Possibility
SNSRC Newsletter **(14 June 1971)**

1. vaeg1a.jpg 2. vaeg1b.jpg 3. vaeg1c.jpg

Shinichi SEIKE G-Strain Amplifier / Monopole Coil

T. Obata: Does the Gravity on Coils of Peculiar Winding Decrease While Electric Currents Flow in the Coils?
S. Seike & K. Tomiyoshi: Japanese Patents
J-L. Naudin: Replication of Seike's G-Strain Amplifier
L. Belfroy: G-Strain Amplifier Tachyon Energy
S. Seike: Lecture
S. Seike: *The Principles of Ultra Relativity* (Excerpts)

---

http://www.emacademy.org/piers2k3/pdf/Obata.O.pdf

Does the Gravity on Coils of Peculiar Winding Decrease While Electric Currents Flow in the Coils?

Tsunehiro Obata, Akiko Ono
(Gunma National College of Technology, Japan)

Many people seem to feel that there must exist a relation between gravity and electricity. Many attempts in this direction have been made. Faraday, for instance, devised experiments in 1850 to find a possible relation between gravity and electricity. After many experiments he could not find any effect. His closing remarks [1], however, encourage many researchers working in this direction.

"Here end my trials for the present. The results are negative. They do not shake my strong feelings of the existence of a relation between gravity and electricity, though they give no proof that such a relation exists."

Since then there have been an enormous number of theoretical and/or experimental investigations searching for a relation between gravity and electricity from different points of view. About thirty years ago, Seike [2] published an exotic theory, ultra relativity, and also he devised coils of peculiar winding, called Klein coils and transistor coils. The weight of these coils was reported to gradually decrease while electric currents flow in the coils. Such coils have extensively been studied by Matsumoto and his students about 1990 [3]. Their experiments also support Seike's statement. However, the experimental results on the peculiar coils are not authorized. The present authors think that the experiments are not careful enough to investigate various factors responsible for the apparent decreasing of the gravity on the coils.

On the background, the authors executed supplemental experiments on Klein coils and transistor coils with the improvement which removes some factors responsible for the apparent decreasing

of the gravity on the coils. The Klein coils were wound by themselves, while the transistor coils were borrowed from Matsumoto through the courtesy of him. The weight of the coils with electric currents was measured by a usual electronic balance. The improved experiments seem to support the decreasing of the gravity on the coils at the present time, but the authors are now executing the experiments with further carefulness. The details of the experiments will be expressed in the symposium.

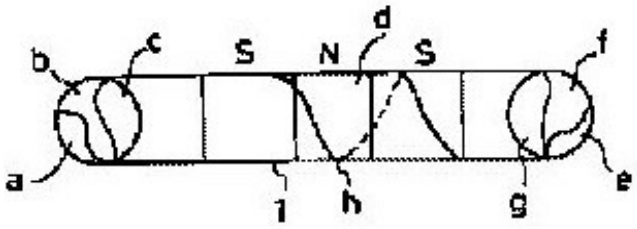
References --

[1] Closing remarks of M. Farady from A. K. T. Assis, Deriving Gravitation from Electromagnetism, Can. J. Phys., Vol. 70, 330, 1992.

[2] Seike, S.,The Principles of Ultra Relativity, revised ed., Japan Division, National Space Research Consortium, Uwajima City, Japan, 1970.

[3] Matsumoto, M., A series of graduation thesis researches directed by him, (unpublished).

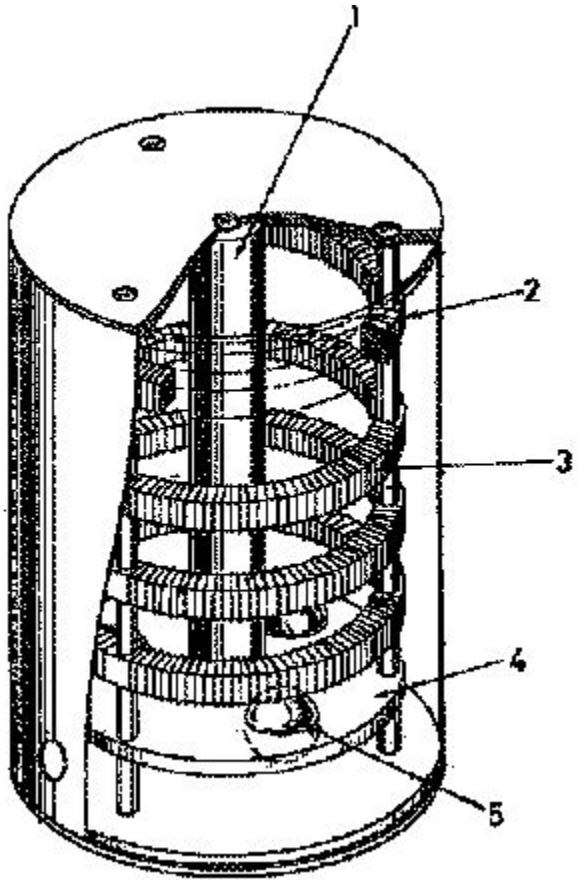
Japan Patent # 6267735
(PDF)
Single-Polar Magnet & Manufacture Thereof
9-22-1994
Shinichi SEIKE; Kazusumi TOMIYOSHI



Classification:- international: H01F1/04; H01F7/02; H01F13/00; H01F1/032; H01F7/02; H01F13/00; (IPC1-7): H01F7/02; H01F1/04; H01F13/00

Abstract --- PURPOSE: To provide a quasi-singlepolar magnet the whole of which is almost N-pole or S-pole. CONSTITUTION: A conductive wire is wound by the Mobius winding around a magnetic pole member 1 consisting of rare earth element such as neodium or praseodium. The coil of the Modius winding is energized with a pulse current in order to magnetize the magnetic member 1. Then, the end parts having one magnetic pole (S-pole) of the resultant magnetic member 1 is cut apart from the center part having another pole (N-pole). Only the end parts of the same pole (S-pole) are bonded with an adhesive agent or the like, thereby forming a quasi-singlepolar magnet.

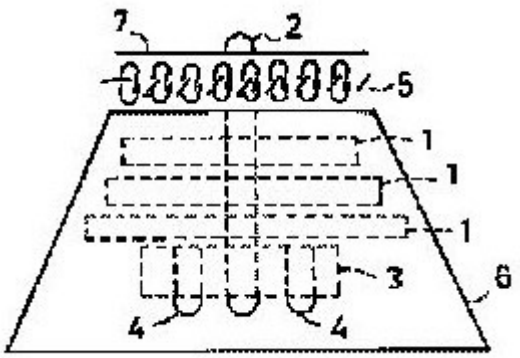
Japan Patent # 6284758
(PDF)
Single-Pole Magnet & Cell Using This Magnet
10-07-1994
Shinichi SEIKE



Classification: - international: H02N11/00; H02N11/00; (IPC1-7): H02N11/00

Abstract --- PURPOSE: To provide a cell capable of obtaining electrical energy without giving external energy by developing a single-pole magnet. CONSTITUTION: A cell is composed mainly of a single pole magnet obtained by magnetizing a magnetic substance to a quasi-single pole as NSN or SNS by a Mobius-wound coil and dividing the magnetic substance into three, a lot core 1 using this magnet, a plurality of colloidal cores 2 separated and mounted in the axial direction of the lot core 1 and as a quasi-single pole magnet homopolar with the lot core 1, a capacitor coil 3 as a single-pole magnetic substance homopolar with the lot core 1 Mobius-wound on the colloidal cores 2, and a capacitor 4 manufacturing a parallel resonance circuit.

Japan Patent # 6269155
(PDF)
Generation Set
9-22-1994
Shinichi SEIKE SHINICHI; Kazusumi TOMIYOSHI



Classification: - international: H02K53/00; H02K53/00; (IPC1-7): H02K53/00
Abstract --- PURPOSE: To obtain a clean generation set, which does not require power, fuel and the like from outside. CONSTITUTION: Three stages of capacitor coils, within conductors of a gold alloy are wound as Melbium windings, are provided in a toroidal core made of rare earth material. A rod-shaped single-pole magnet 2, which is magnetized as a quasi-single pole, is arranged so as to pass the centers of the toroidal cores. A resonance disk 3, wherein three gold balls 4 are equally embedded, is provided. The same exciting power coils 5 as the capacitor coils 1 are provided. A nuclear electric resonator and a resonance circuit are formed of single- pole magnet 2, the capacitor coils 1 and the resonance disk 3. The three-phase AC generated in the coils in the Moebius winding is taken out outside.

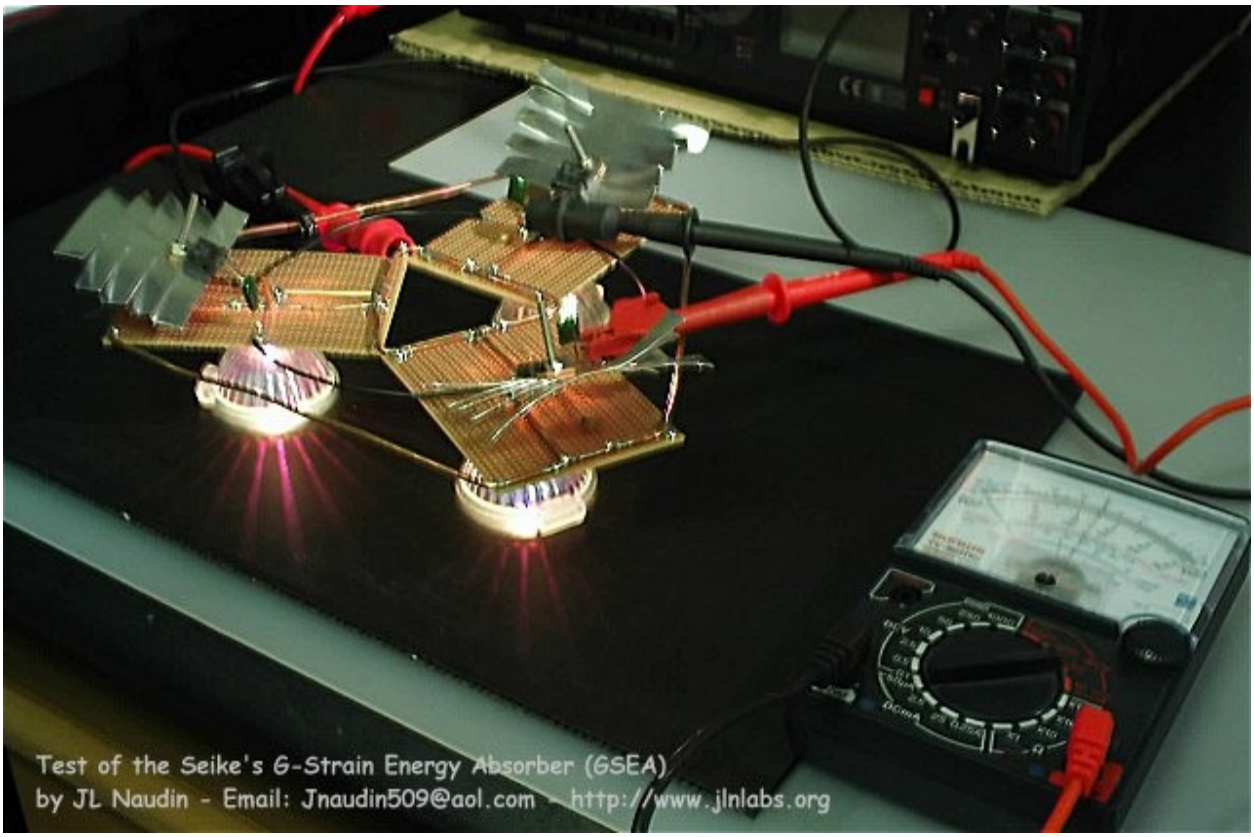
---

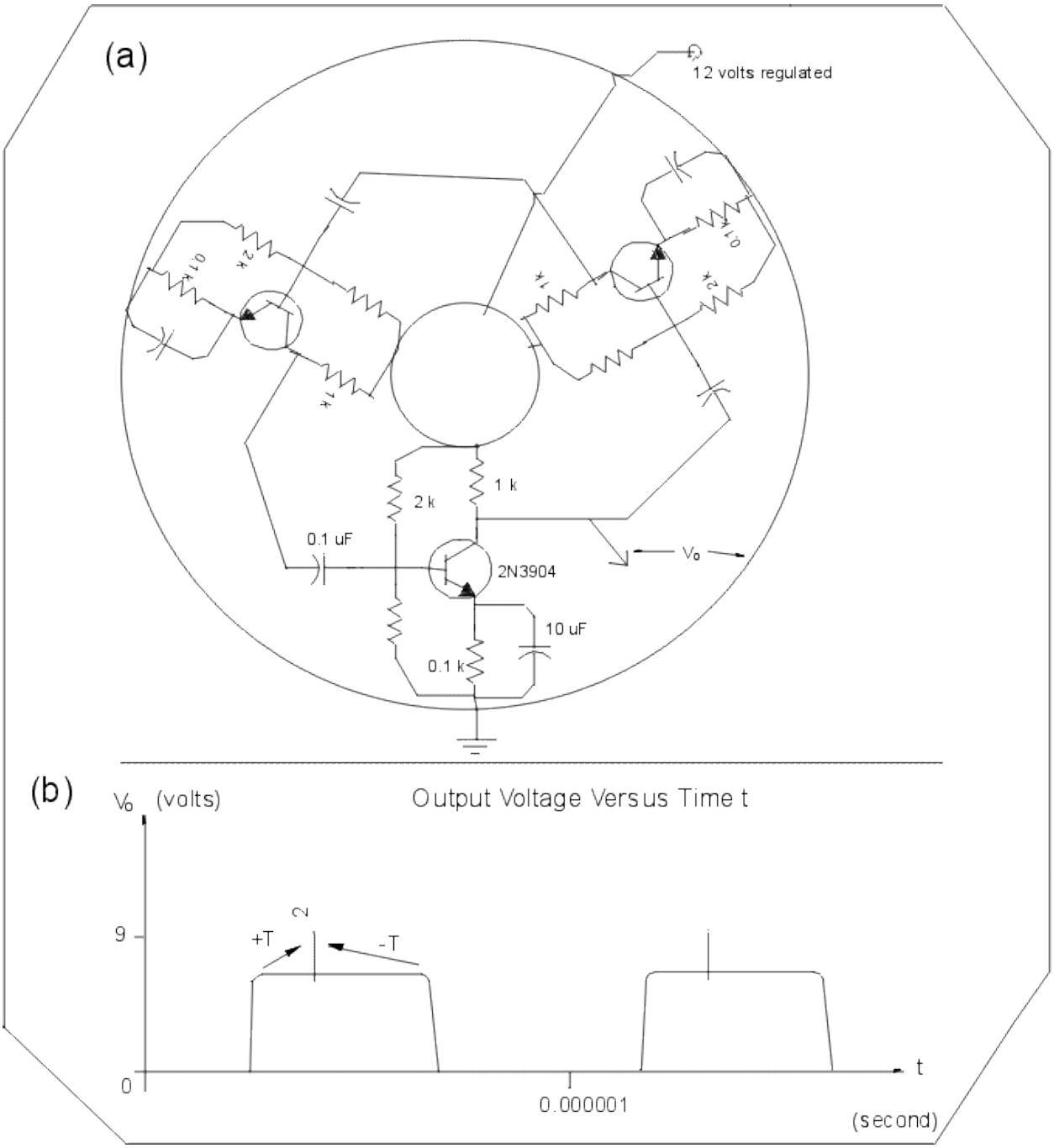
http://jnaudin.free.fr/html/gseamnu.htm
http://jnaudin.free.fr/index.htm (Home Page)

Replication of Seike's G-Strain Amplifier

by

Jean-Louis NAUDIN


Test of the Seike's G-Strain Energy Absorber (GSEA)
by JL Naudin - Email: Jnaudin509@aol.com - http://www.jlnlabs.org


(a)
12 volts regulated
0.1k
2k
1k
7k
1k
0.1k
2k
1 k
2 k
0.1 uF
2N3904
Vo
10 uF
0.1 k
(b)
Vo (volts)
Output Voltage Versus Time t
9
0
+T
-T
t
0.000001
(second)

Abbreviated Report on Prof. Seiki about the use of the G-Energy

Professor Shinichi Seiki, Uwajima City, Ehime Prefecture, Japan, developed a somewhat more elaborate theory of the Lorentz-Force, incorporating the use of the "ether."

Starting with the so-called "Kramer-equation," which describes the movements of atoms in the presence of exterior electrical and magnetic fields-the basic components of the Lorentz-force-Professor Seiki conceived of the possibility of creating "negative gravitational energies" by utilizing a suitable electro-magnetic field.

Currently, in a process called NMR (Nuclear Magnetic Resonance), we only utilize the charges in spatial electron spins due to the application of magnetic fields. The substance to be examined is placed in a high frequency field, and we observe energy absorption effects peculiar to the frequencies typical of a given molecule of matter.

Seiki went one step further and introduced NER (Nuclear Electrical Resonance),which influences both the polar and the axial spin. Polar spin, he claimed, is directly related to the gravitational field.

Describing a rotating electrical AC field superimposed on a DC magnetic field, he claims that an exponential increase of "negative gravitational energies" occurs at a certain resonance frequency. This means that energy from the earth-gravitational field enters the system of the secondary artificial field created by the anti-gravitational motor. The negative G-energies cause a weakening of the earth-gravitational field,ultimately cancelling it altogether. Further depolarization then causes the vehicle to be repulsed by the larger gravitational body (earth).

It seems that the reason Prof. Seiki's NER effects have not been "officially" utilized, is that nuclear electrical resonance can only occur only at extremely high electrical voltage simultaneously with ultra-high AC frequencies.

Below this threshold, the probability of negative-G-energy conditions is extremely small. Above this critical frequency (also called - "Larmor Frequency"), the effect of this type of gravity engine is also dependant upon the electro-magnetic polarization potential of materials used.

Professor Seiki proposes ferromagnetic substances, such as ferrit and ferromagnetic materials such as barium-strontium-titanate. In his design, three spherical condensers are alternately charged and discharged by three magnetic coils. At first glance, the entire idea seems to be just another "perpetuum mobile."

However, the only energy transformed used is that of gravitational energy into mechanical and electrical and vice-versa.

Seiki calculated a power output of 3*10^9 KW for an anti-gravity engine, using one ton each of ferrit and barium-strontium-titanate for design. This is more than the total output of a Saturn rocket, but, even so, Seiki's vehicle could carry a payload of about one ton!

Professor Seiki's work does seem to be taken seriously, as attested to by the fact that DR. WERNHER VON BRAUN considered it of sufficient interest to discuss it personally with him during one of Von Braun's trips to Japan.

Excerpted from Professor Shinichi Seike's book,
"The Principles of Ultra Relativity".
NACHTRAG ZU DEN ENERGIE-KONFERENZEN IN HANNOVER UND TORONTO

The Transistorized Coil: A Novel, Clean Energy Tool

As calculated by Lev Davidovich Landau, Nobel laureate in Physics (1962) g strain energy (also known as the Landau g factor) of:

$$w = (-g^2)/(8\pi k[erg/cm^3]), \qquad (1)$$

is stored throughout the entire terrestial space, where:

$$g = 980\ cm/sec^2,$$

and k stands for Newton's g constant of:

$$k = 6,670 \times 10^{-8}\ dyn.\ cm^2/g.$$

With this in mind, it is known that the energy of:

$$w = -5.4 \times 10^{11}\ erg/cm^3 \qquad (2)$$

is present in our terrestial space. This energy is available and could become a clean energy source and be potentially more available than Nuclear Fusion.

It has been, however, difficult to convert g strain energy into electric power because it is in a state of negative energy. One is reminded that in Paul A. M. Dirac's Theory of Particles and Anti-Particles, there are four states of entity:

1) Occupied state of positive energy (e. g., electrons);

2) Unoccupied state of positive energy (e. g., "holes" as treated in Semiconductor Physics);

3) Occupied state of negative energy;

4) Unoccupied state of negative energy (e. g., positrons)

States 2) and 3) are in a negative energy state, while states 1) and 4) are considered to be in a positive one. From this, one knows that it is necessary to convert the g strain energy into power with "holes" (the unoccupied state of the electron). Now, in reality, g strain energy is composed of "holes", as is illustrated schematically in Figure 1.

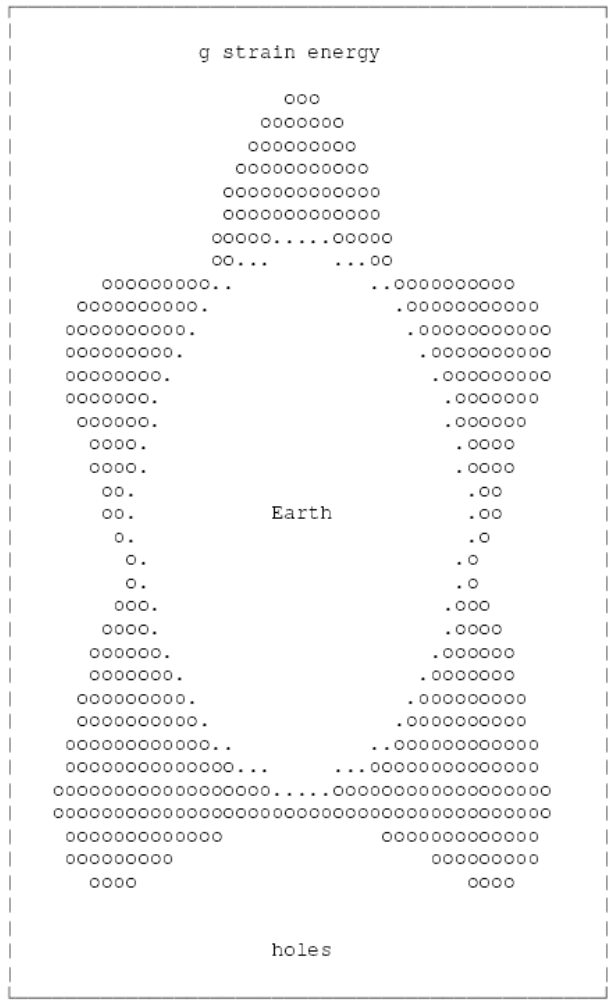


Figure 1

The g Strain energy absorber

A closed amplifier (transistorized coil) can be designed to absorb the gstrain energy. As is known, the p type of semi-conductor carries "holes"(unoccupied state of electrons). In order to absorb g strain energy, such material is required. Though a semi-conductor coil is desirable, it is difficult to obtain. Hence, a transistorized coil is selected since either silicon or germanium may be used as transistors.

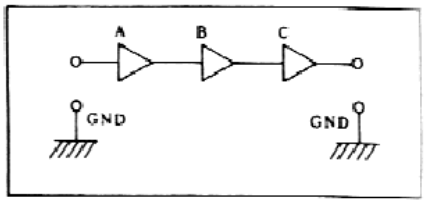


Figure 2

As is shown in Figure 2, an ordinary amplifier is open. The signal is amplified at the A stage, amplified again at the B stage and finally at the C stage, and then terminates. At this time, it is appropriate to design a closed amplifier as shown in Figure 3, in which the signal is amplified by the stage A again, after it is done with A, B and C. Such amplification can continue, giving the device aname that is chosen as "Endless Amplifier", and which demonstrates some interesting characteristics. One characteristic is displayed with the circuit diagram in Figure 4, where three 2SC521 A's form the closed amplifier. Detection of oscillation shows that the frequency of this circuit's system decreases with time, as indicated in Table 1.

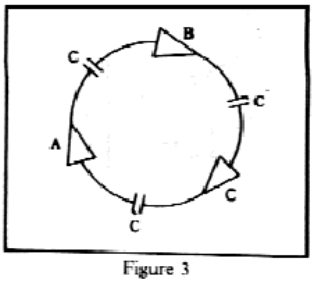


Figure 3

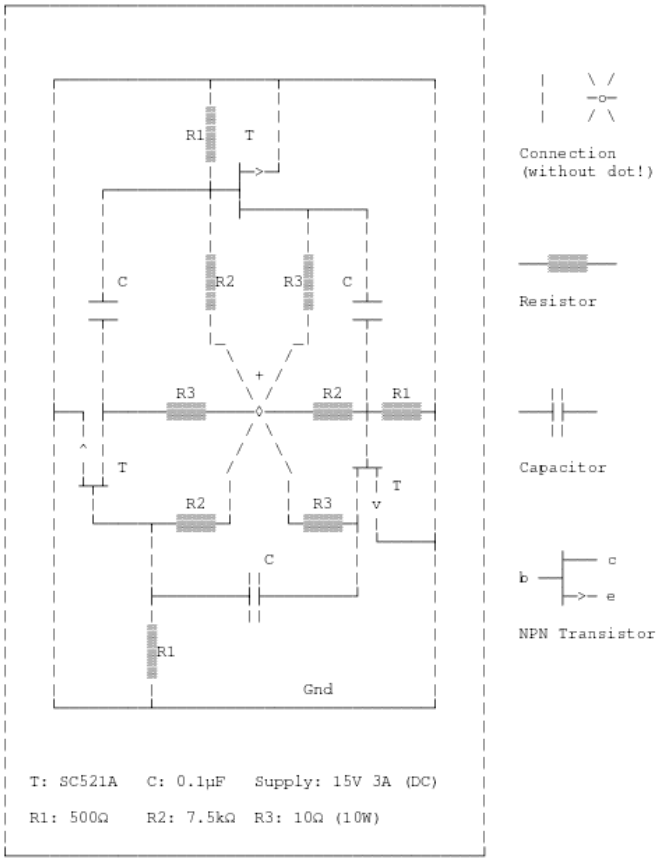


Figure 4

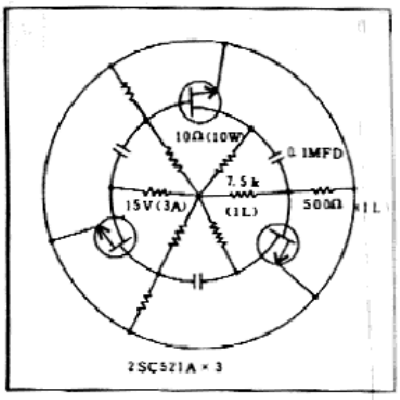
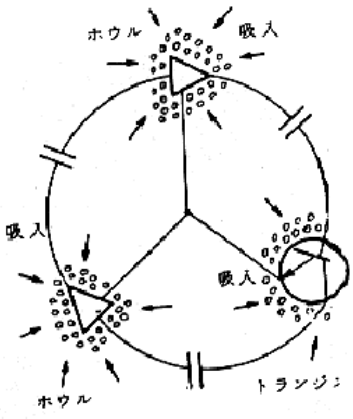


Figure 4



Often it is discused in quantum physics that the energy of quanta is proportional to angular frequency such that:

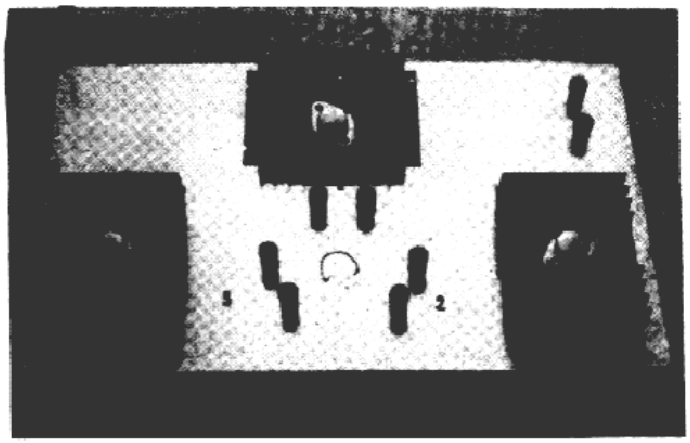
$$W = (h/2\pi)\ \omega \qquad (3)$$

$$W = h\ f \qquad (4)$$

where $h/2\pi$, h and ω stand for Planck's constant, Planck's one and the angular frequency of:

$$\omega = 2\ \pi f \qquad (5)$$

respectively. This result maintains that the energy of the system decreases with time by absorbing negative energy of g with transistors.
An example of the transistorized coil is shown on the following Photo (2SC521A x3).



The experimental specifications are:

- Collector potential (B potential): 5 V DC (stabilized)
- Cycle counter FC756 by Trio Limited
- Impedance Matching: 50Ω . Attenuation: 1/10
- 2SC521A = Silicon NPN Triple Diffused MESA Transistors
- Date: Jannuary 26, 1981.

Time	Frequency	Time	Frequency
13:51	1.2767 MHz	14:01	1.2666 MHz
52	1.2710	02	1.2661
53	1.2707	03	1.2658
54	1.2701	04	1.2655
55	1.2695	05	1.2651
56	1.2689	06	1.2648
57	1.2684	07	1.2645
58	1.2680	08	1.2642
59	1.2678	09	1.2639
14:00	1.2670	10	1.2636

Table 1

Over-efficiency of the transistorized coil

The oscillation potential exceeds theortical values as the input potential increases.

The transistorized coil is, at the same time, a three-phase oscillator, where stages A, B and C become the 3 terminals for the three-phase current, as in the following Figure 5:

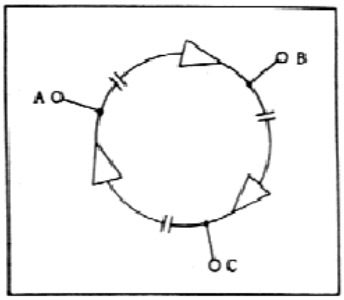


Figure 5

If one feeds in DC voltage between the lines, AC potential must be DC/2 to the single phase, while it in turn must be (DC/2)x√3 between the phases (for example, between A and B) to the three-phase current.

In the following Table 2, the theoretical value is compared with actual output, with the resultant percentage efficiency:

IN (DC volt)	5	10	15
(DC/2) x √3 (volt)	4.33	8.66	13.0
OUT (volt)	3.3	7.2	21.0
Efficiency (%)	76	83	162

Table 2

Thus, low input (DC) leads to lower efficiency. But the percentage efficency exceeds 100% when one feeds in, for example, a 15 volt DC, which evidently shows that the "holes" have managed to flow into the transistorized coil (or,the "Endless Amplifier").

Some features of the novel energy

This energy is quite different from ordinary electrical power because it is negative. It will have a low temperature, since the thermal energy of negative energy can be computed to be:

$$kT < 0,$$

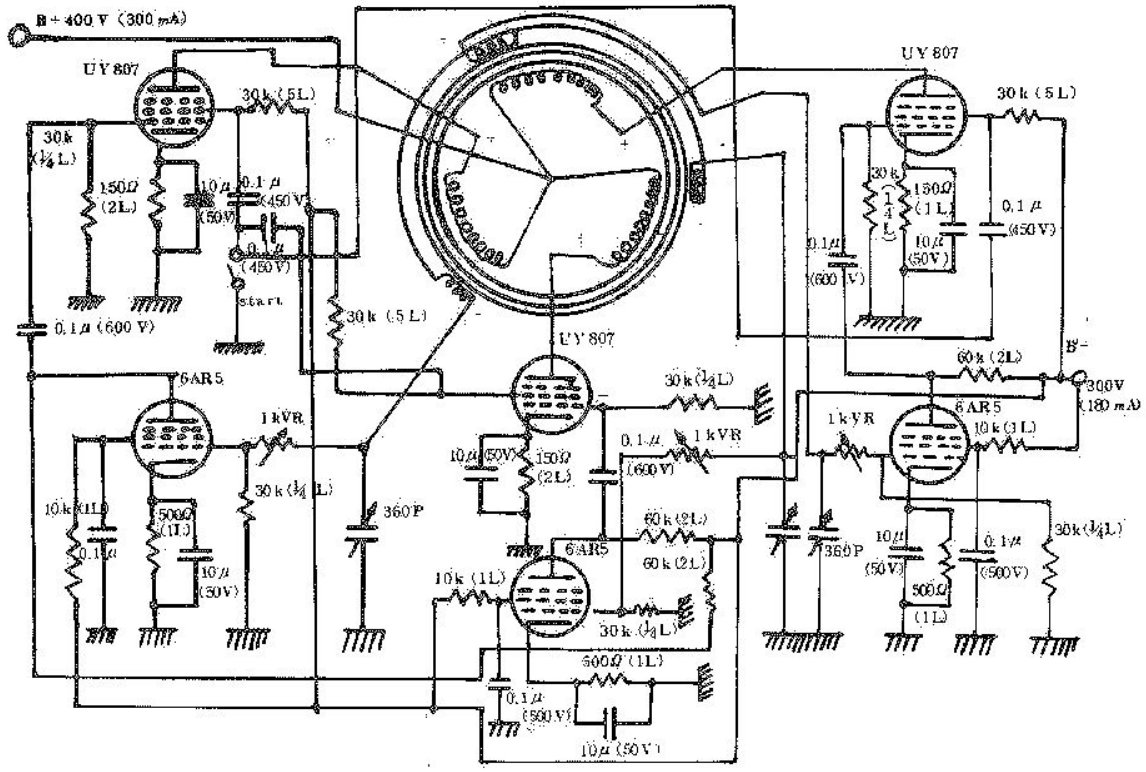
where k and T denote the Boltzmann constant and the Kelvin temperature,respectively.

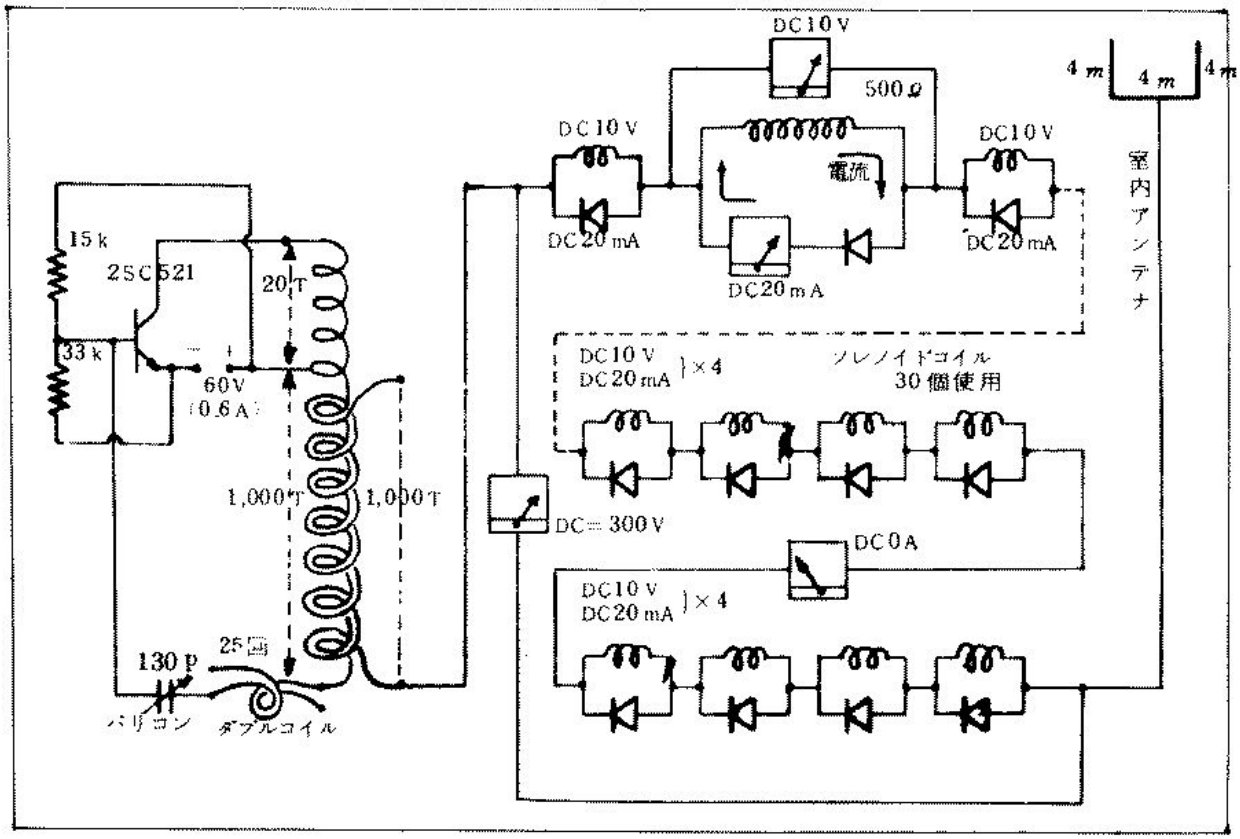
The transistorized coil would scarcely emit heat when a large "hole" current flows; it is quite clean. Yet, the magnetic field can be generated, since a "hole" owns a charge. Physicists have intuitively felt that g energy would not be easily melt, since it is frozen onto the background space. This has, indeed been true as one uses an ordinary copper coil.

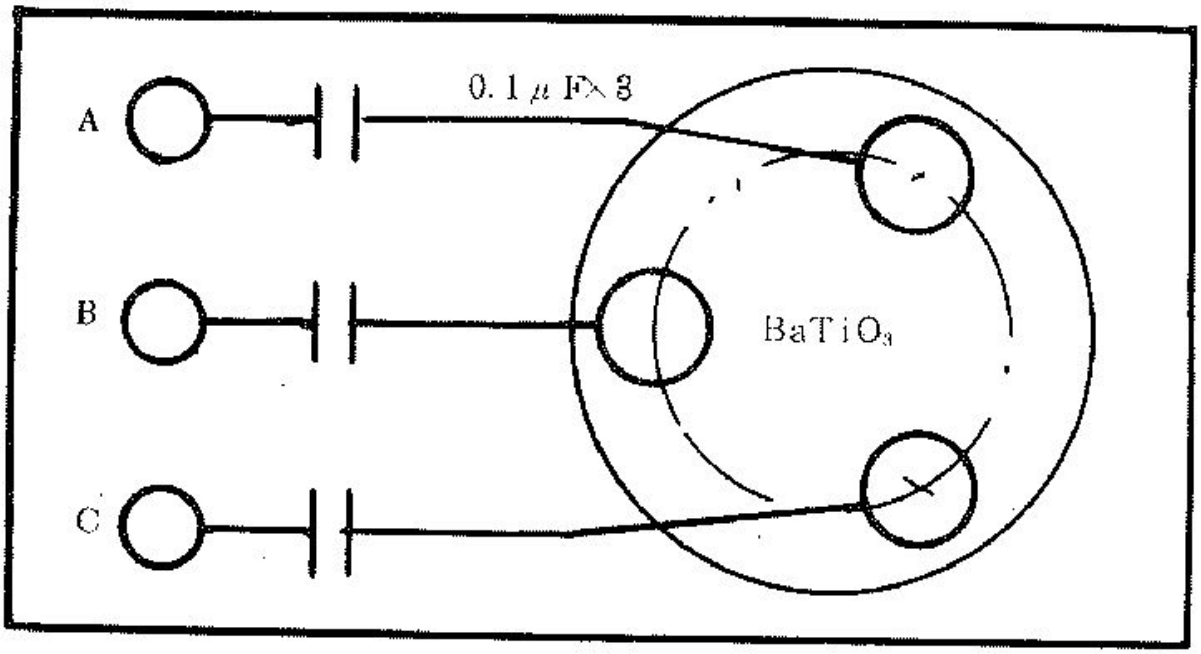
However, the use of a transistorized coil makes possible the acquisition of that same energy. G strain energy is limitless and free. In this sense, our method is quite revolutionary. With the transistorized coil, one can obtain an endless supply of electric power, where and when it is required, beyond the limits of sources of supply and transportation requirements. Only conversion apparati are required. Owing to the pair production concept sof Paul Dirac, matter and particles can literally be boren out space itself!

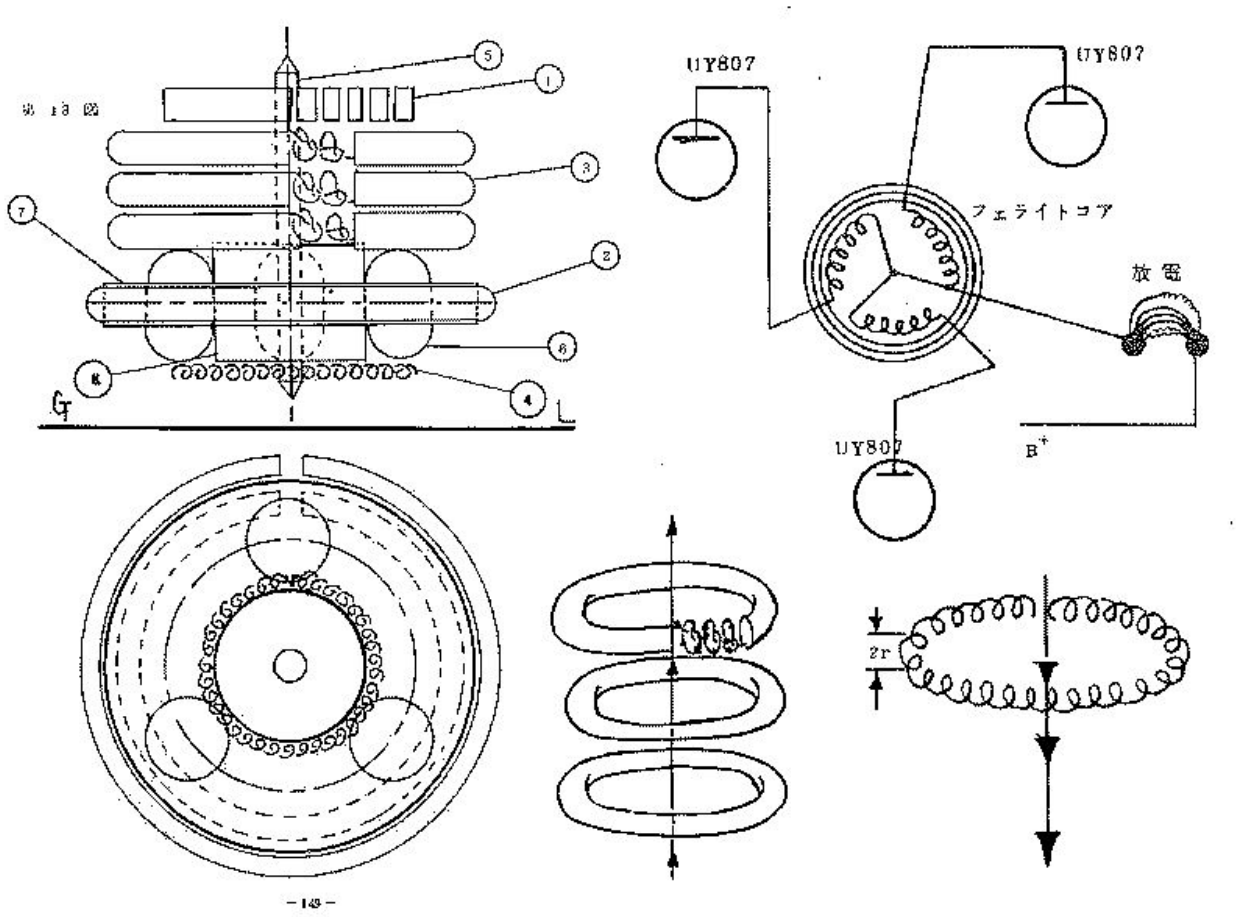
This space is, as it were, the mother of entity. Thus the "space age" follows the atomic age. The power of g strain energy is more advanced than nuclear power as it is a more advanced philosophy in quantum physics and relativistics.

(Shinichi Seike)More information is available in a book by Prof. Shinichi Seike, "The Principles of Ultra Relativity", available from the G Research Laboratory, P.O. BOX 33, Uwajima Post Office, Ehime (798), Japan.


B+400V (300mA)
UY807
30k (5L)
30k (1/4L)
150Ω (2L)
10μ (50V)
0.1μ (450V)
0.1μ (450V)
start
0.1μ (600V)
6AR5
1kVR
10k (1L)
0.1μ
500Ω (1L)
10μ (50V)
30k (1/4L)
360P
30k (5L)
UY807
30k (1/4L)
10μ (50V)
150Ω (2L)
0.1μ (600V)
1kVR
6AR5
60k (2L)
60k (2L)
10k (1L)
30k (1/4L)
600Ω (1L)
0.1μ (500V)
10μ (50V)
UY807
30k (5L)
30k (1/4L)
150Ω (1L)
10μ (50V)
0.1μ (450V)
0.1μ (600V)
60k (2L)
B-
300V (180mA)
1kVR
6AR5
10k (1L)
10μ (50V)
0.1μ (500V)
500Ω (1L)
30k (1/4L)
360P


DC10V
500Ω
4m
4m
4m
室内アンテナ
DC10V
DC20mA
電流
DC20mA
DC10V
DC20mA
15k
2SC521
20T
33k
60V
(0.6A)
1,000T
1,000T
DC10V
DC20mA
×4
ソレノイドコイル
30個使用
DC=300V
DC0A
DC10V
DC20mA
×4
130p
25回
バリコン
ダブルコイル


A
B
C
0.1μF×3
BaTiO3

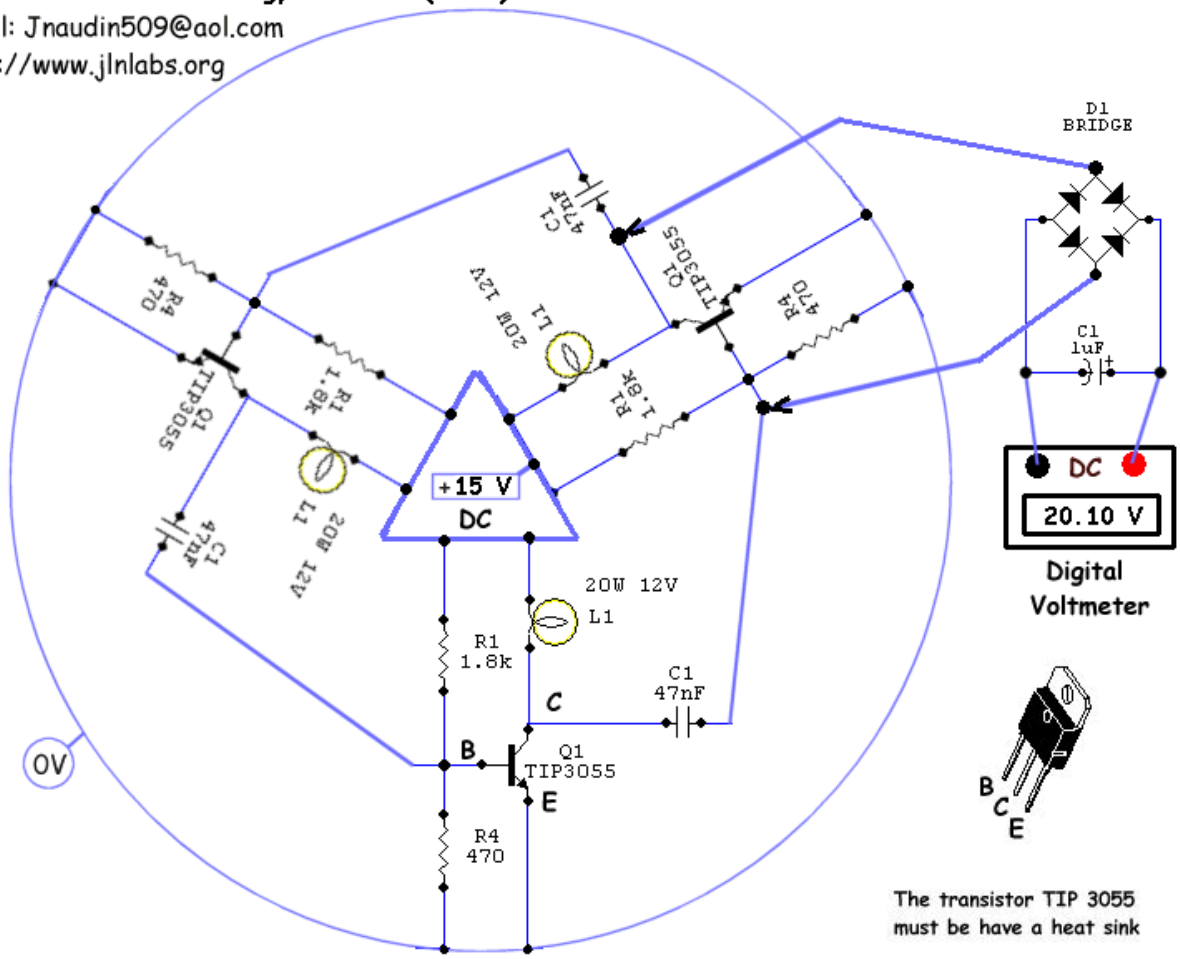


See also:

http://jnaudin.free.fr/seike/gseav3.htm
http://jnaudin.free.fr/html/gseadiag.htm
http://jnaudin.free.fr/html/gsea21.htm

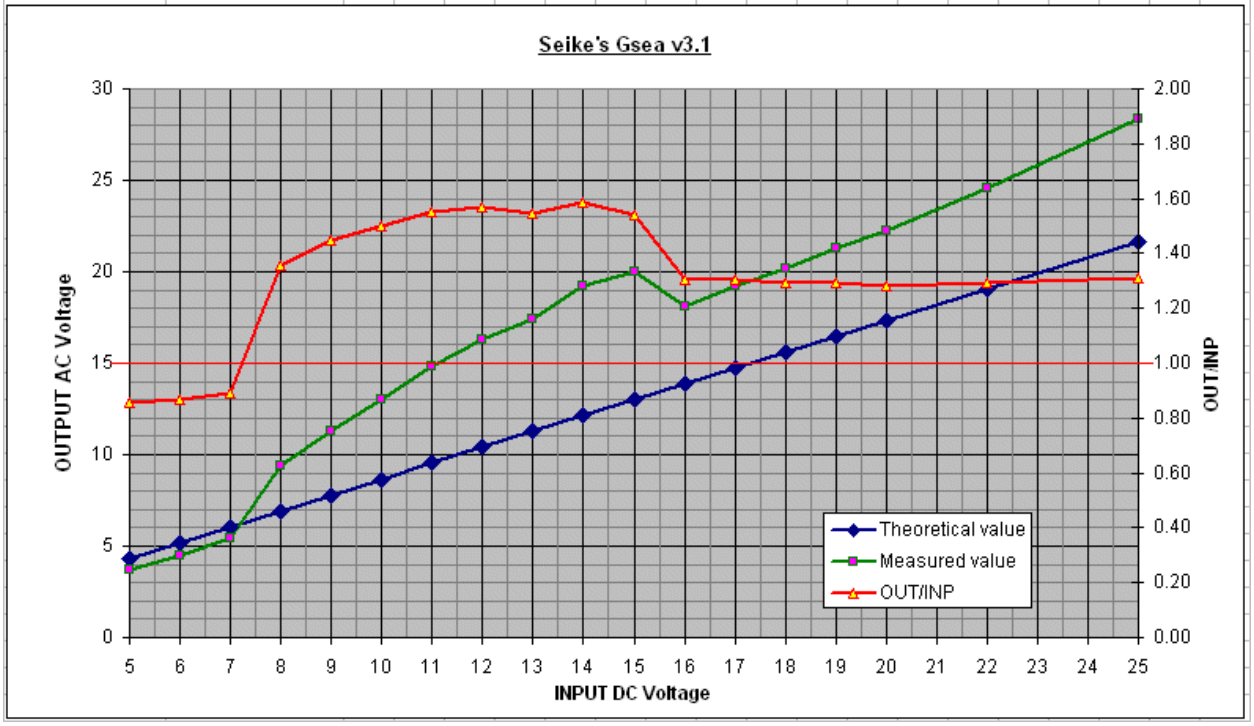
The Seike's G-Strain Energy Absorber (GSEA) v3.1

Email: Jnaudin509@aol.com
http://www.jlnlabs.org



The transistor TIP 3055 must be have a heat sink

Seike's GSEA v3.1 tests																			JL Naudin - Dec 2005
	INPUT (DC Volt)	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	22.0	25.0
Theoretical value	(D/2) x V3 (volt)	4.3	5.2	6.1	6.9	7.8	8.7	9.5	10.4	11.3	12.1	13.0	13.9	14.7	15.6	16.5	17.3	19.1	21.7
Measured value	OUTPUT DC (volt)	3.7	4.5	5.4	9.4	11.3	13.0	14.8	16.3	17.4	19.2	20.0	18.1	19.2	20.2	21.3	22.2	24.6	28.4
	OUT/INP	0.85	0.87	0.89	1.36	1.45	1.50	1.55	1.57	1.55	1.58	1.54	1.31	1.30	1.30	1.29	1.28	1.29	1.31



---

http://www.spots.ab.ca/~belfroy/space-timeinformation/tachyonDetector.html

Round Amplifer: Tachyon Detector

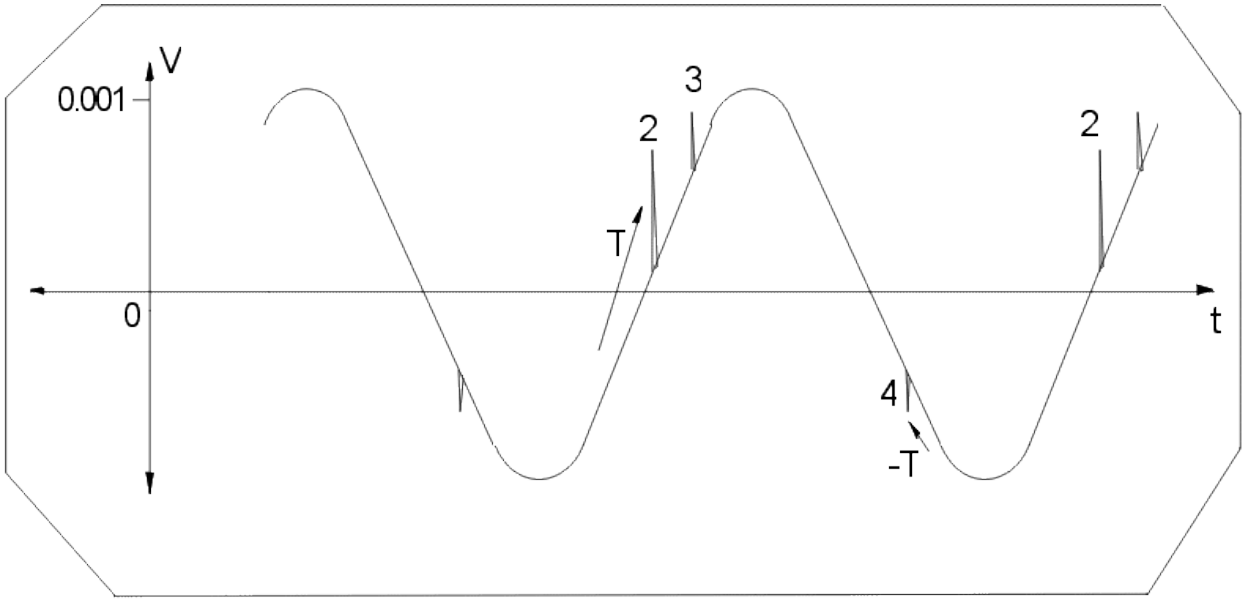
by

Len Belfroy

A tachyon particle if it exists is a particle that can travel faster than the speed of light. The model of the tachyon a hypothetical particle was invented by Gerald Feinberg. It may have a mass and size smaller than that of a light photon. Since tachyons can travel faster than light speed c, it may be able to travel through time. Tachyons or this type of tachyon may be able to be send through time to the recent past or future time. The volume of the tachyon may be smaller that the volume of a light photon if a photon has a volume. A light photon is a particle of light. Tachyons may be produced pr polarized in semiconductors such as a transistor. Positive or negative electrical potentials in semiconductors may contain positively or negatively electrically charged tachyons. The negative electric charge may make negatively charged tachyons or negative energy -T more dominant than positively charged tachyons in the electric field. Positively charged tachyons +T may be moving forward in time, while negatively charged tachyons -T may travel backwards in time. Tachyons may be small waves through the fourth dimension a little like waves of sound in

air. If electrons are in a strong negatively charge tachyon field -T, the electron may travel a few milliseconds backwards in time. Tachyons may be able to effect the electric charge inside semiconductors and show as narrow voltage spikes.

There may be an electrical experiment for producing tachyons. Figure 1(a) shows a copy of a round amplifier tachyon detector which was invented by Professor Shinichi Seike of Japan. Electric charges in a semiconductor may be sending tachyons through small regions of local space-time a little like puffs of air making waves over water or like radio waves in three dimensional space-time. Tachyon T and -T signal amplitudes are weaker than radio waves in the same semiconductor. The round amplifier consists of three identical transistor stages. Some of the electric output power of the last amplifier is send to the input of the first amplifier stage. Electrical connectionslines between transistors are short. This produces a round amplifier or electronic oscillator circuit. Figure 1(b) graph shows an approximate copy or sketch of the output voltage Vo versus time t from the round amplifier. It is a copy of the signal voltage Vo read or displayed by an electronic oscilloscope.

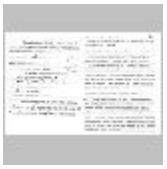


Sinichi SEIKE Lecture

(Click Thumbnail to open in new window)

(1)

(2)

(3)

(4)

(5)

(6)

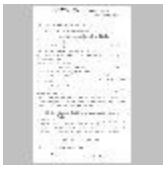
(7)

Excerpts:

" *The Principles of Ultra Relativity* "

by

Shinichi SEIKE

(Click Thumbnail to open in new window)

(1)

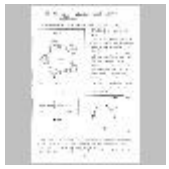
(2)

(3)

(4)

(5)

(6)

(7)

(8)

(9)

(Figures)

Roger J. SHAWYER
Microwave Electromagnetic Space Drive

SPR Ltd
Unit 40, Broadmarsh Centre, Havant, Hampshire, United Kingdom, PO9 1HS
T : 01243 377783
W : http://www.emdrive.com
E : sprltd@emdrive.com

SPR Ltd.

Theory

Development

Benefits

"EM Thrust Drive Technology will Dominate Space"

Tom Sheelley : "No-Propellant Drive Prepares for Space and Beyond"

Criticism

GB # 2399601 : Thrust Producing Device using Microwaves

GB # 2334761 : Microwave Thruster for Spacecraft

GB # 2229865 : Electrical Propulsion Unit for Spacecraft

USP # 5543801 : Digitally Controlled Beam Former for a Spacecraft

---

http://emdrive.com

SPR Ltd.

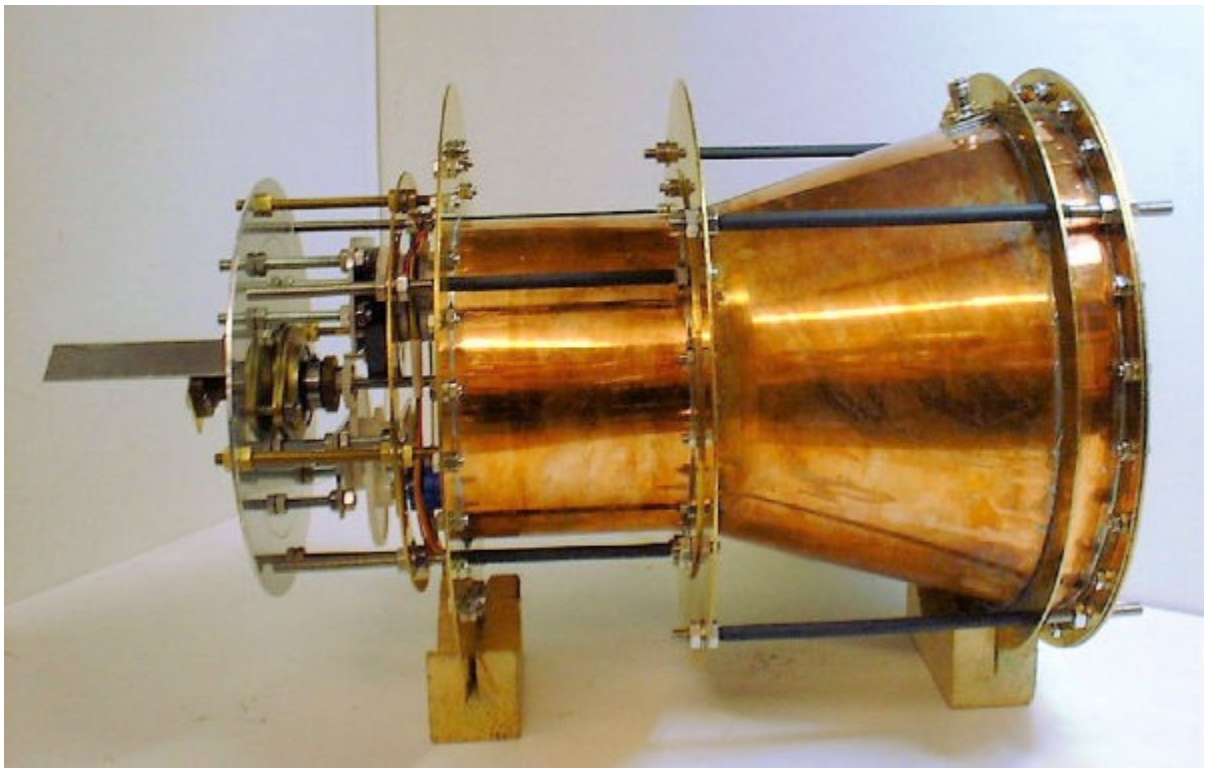
Satellite Propulsion Research Ltd (SPR Ltd) was formed in October 2000 as the corporate vehicle for progressing the development of a new form of electric propulsion. This electromagnetic “EmDrive” technology provides direct conversion of electrical energy to thrust, using radiation pressure at microwave frequencies in a tapered, high Q, resonant cavity.

The first UK government funded programme was a feasibility study completed in 2002. This work confirmed the theoretical predictions in a large series of tests using an experimental thruster. In addition, the huge potential savings for the space industry were identified during the preparation of a business model.

Following an independent review of the feasibility study report, a Demonstrator programme was authorised. This covered the design, manufacture and test of an S Band Demonstrator Engine. The Engine successfully demonstrated viable performance in both Static and Dynamic test programmes, and provided the basic knowledge to design the Flight Model Thruster. Once again a full technical report was prepared and reviewed before acceptance by the UK government.

A feasibility study is currently underway to investigate second generation superconducting technology. This includes the design, build and test of an experimental thruster operating at liquid nitrogen temperature.

A flight model development programme has started on a 300W, C band thruster, specified to produce 85mN thrust.



http://emdrive.com/principle.html

Theory

Principle of Operation

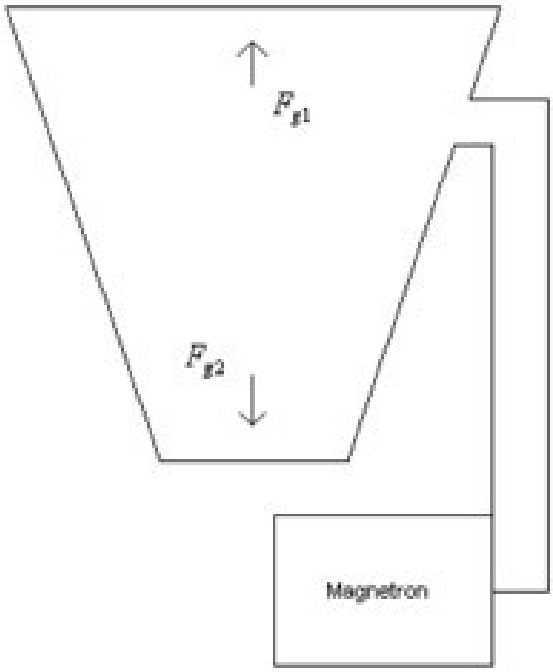
At first sight the idea of propulsion without propellant seems impossible. However the technology is firmly anchored in the basic laws of physics and following an extensive review process, no transgressions of these laws have been identified.

The principle of operation is based on the well-known phenomenon of radiation pressure. This relies on Newton's Second Law where force is defined as the rate of change of momentum. Thus an electromagnetic (EM) wave, travelling at the speed of light has a certain momentum which it will transfer to a reflector, resulting in a tiny force.

If the same EM wave is travelling at a fraction of the speed of light, the rate of change of momentum, and hence force, is reduced by that fraction. The propagation velocity of an EM wave, and the resulting force it exerts, can be varied depending on the geometry of a waveguide within which it travels. This was demonstrated by work carried out in the 1950's. (CULLEN, A.L. 'Absolute Power Measurements at Microwave Frequencies' IEE Proceedings Vol 99 Part 1V 1952 P.100)

Thus if the EM wave travelling in a tapered waveguide is bounced between two reflectors, with a large velocity difference at the reflector surfaces, the force difference will give a resultant thrust to the waveguide linking the two reflectors. If the reflectors are separated by a multiple of half the effective wavelength of the EM wave, this thrust will be multiplied by the Q of the resulting resonant cavity, as illustrated in fig 1.

Fig 1. Diagram of an engine concept.



The inevitable objection raised, is that the apparently closed system produced by this arrangement cannot result in an output force, but will merely produce strain within the waveguide walls. However, this ignores Einstein's Special Law of Relativity in which separate frames of reference have to be applied at velocities approaching the speed of light. Thus the system of EM wave and waveguide can be regarded as an open system, with the EM wave and the waveguide having separate frames of reference.

A similar approach is necessary to explain the principle of the laser gyroscope, where open system attitude information is obtained from an apparently closed system device.

Video : http://www.youtube.com/watch?v=57q3_aRiUXs

---

http://emdrive.com/demonstratorengine.html

The Development of a Demonstrator Engine

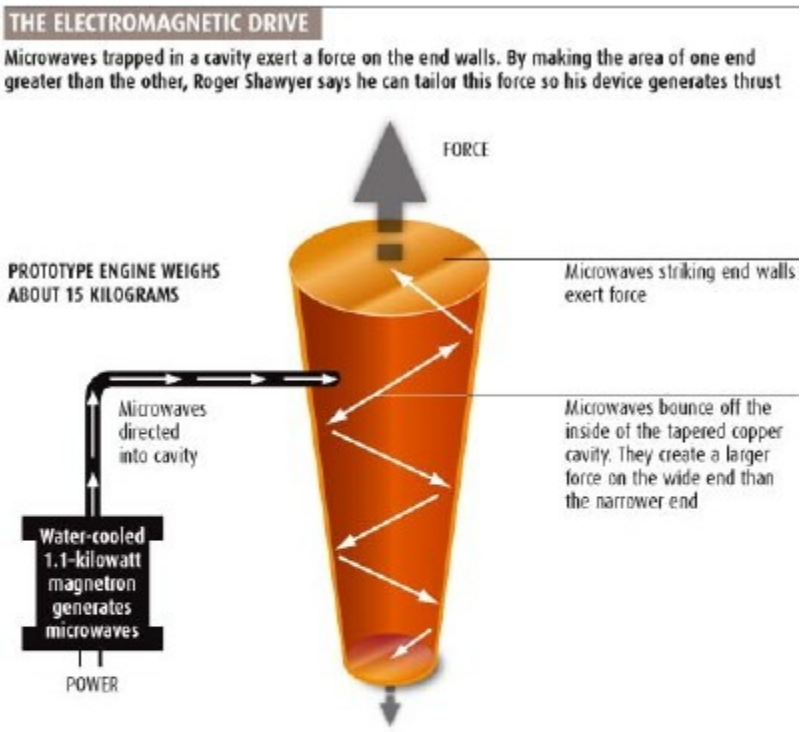
Although the experimental thruster had verified the static thrust equation, it became apparent that the concept would not become generally accepted until a viable engine could be demonstrated. Accordingly, a proposal for the design, manufacture and test of a complete demonstrator engine was submitted to DTI. A Research and Development grant was awarded in September 2003 and the work started with a mission analysis phase.

This work enabled the specification of the demonstrator engine to be optimised against the requirements of a typical commsat mission. Unlike the experimental thruster, the engine would be rated for continuous operation and extensive design work was required to increase the specific thrust by raising the design factor and unloaded Q.

The engine was built with a design factor of 0.844 and has a measured Q of 45,000 for an overall diameter of 280 mm. The microwave source is a water cooled magnetron with a variable output power up to a maximum of 1.2 kW.

To obtain the predicted thrust the engine must maintain stable resonance at this high Q value. Major design challenges have included thermal compensation, tuning control and source matching.

The engine was tested in a large static test rig employing a calibrated composite balance to measure thrust in 3 directions, up, down and horizontal. A total of 134 test runs were carried out over the full performance envelope, with a maximum specific thrust of 214mN/kW being measured.


THE ELECTROMAGNETIC DRIVE
Microwaves trapped in a cavity exert a force on the end walls. By making the area of one end greater than the other, Roger Shawyer says he can tailor this force so his device generates thrust
FORCE
PROTOTYPE ENGINE WEIGHS ABOUT 15 KILOGRAMS
Microwaves striking end walls exert force
Microwaves directed into cavity
Microwaves bounce off the inside of the tapered copper cavity. They create a larger force on the wide end than the narrower end
Water-cooled 1.1-kilowatt magnetron generates microwaves
POWER

How the electromagnetic drive compares

Engine	European Space Agency's SMART-1 ion engine	Electromagnetic drive
Power required	700 watts	700 watts
Thrust generated	70 millinewtons	88 millinewtons
Operational life	1.6 years	15 years
Weight	94 kilograms	9 kilograms

---

http://emdrive.com/benefits.html

Benefits

Cost Performance Improvement

The EmDrive makes possible a big improvement in the cost performance of the Next Generation of Satellites.

The EmDrive offers a more elegant solution to satellite propulsion than any other form that exists today.

Satellites are not burdened with heavy propellant subsystems. The satellite platform configuration can dispense with the tanks, pipes and valves and the propellant itself.

Launch site and programme costs are reduced as propellant procurement and handling costs are eliminated.

LEO to GEO Security and more effective Mission Control

Satellites launched into LEO can then be positioned into their allocated orbit using the existing solar array generated electrical power in 30 days.

The satellite is more maneuverable and errors in positioning can be corrected from Mission Control without damage or loss to the satellite.

Launch mass savings of 60% plus can be made per satellite launch.

Overall cost savings in fuel, orbit management and satellite design can save up to 70% of the total mission cost.

At least two satellites can be launched using the same launch vehicle.

Further satellite redesign can take advantage of the reduction in hardware required, which could enable three satellites of similar mission to replace the one satellite using conventional thruster combinations.

Longer Satellite Lifetime

The specified operating life of the most critical component, the microwave source cathode is 15 years.

Standard space industry cathode technology can be employed.

Test cathodes have given an accelerated lifetime of up to 30 years.

With the increased deployment of space stations, a satellite can be moved from its orbit to a space station for both scheduled and unscheduled maintenance.

The simpler satellite platform layout will enable maintenance as well as upgrades to the payload to be made more quickly and efficiently.

A typical satellite using such maintenance procedures could have an effective lifetime of as much as 30 to 45 years.

Flexible repositioning of Orbits

An almost unlimited energy source from the solar panels, via the onboard batteries, offers unlimited orbit adjustment.

Orbit adjustment can be made at any time and can be made on a continuous basis as required.

Payloads and Missions can be Enhanced

Existing launchers can be used to launch larger satellites into Geostationary orbit.

Satellites of 20 tonnes per launch will not be uncommon.

Deep space probes can be made to go deeper into the outer reaches of space.

Scientific Missions can stay in operation longer and can be manipulated to view ad hoc situations without fear of loss of fuel for the thruster.

The Commercial and Social Benefits of Lower Satellite Costs

Lower satellite launch and operational costs can be used to reduce transponder prices to satellite service providers typically by 50-70%.

1. Increased use of satellites for two way broadband communications for data, image and phone will open up new markets.

2. New markets and lower costs will provide more competition amongst SSPs and increase technology investment in new applications.

3. Technological innovation, which to date has been slower in space related endeavours will now be accelerated.

4. This will lead to new markets for satellite data transmission.

5. It will provide a more universal coverage of information for all countries and regions on this planet.

Lower all-round costs and longer effective satellite lifetimes will ease budgetary pressures on governments in the race in space.

In the emerging countries new social services can be opened up on a wider scale than are currently available.

1. Broadband multimedia can be used for education, health awareness, field hospitals and instruction on the maintenance of consumer goods.

2. It will enable schools and communities in different countries to talk to each other and share their cultures and ideas.

3. Wildlife can be monitored more cost effectively on a wider scale.

4. Weather monitoring and mineral prospecting, to name two examples can be employed more cost effectively and on a more timely basis.

5. Global emergency planning in the event of natural disasters can have a wider more cost effective coverage.

---

http://news.softpedia.com/news/Emdrive-Thrust-Technology-Will-Dominate-Space-94224.shtml

EM Drive Thrust Technology Will Dominate Space

China's space attempt may be fueled by the newly-emerging technology that the majority of scientists are now contesting. Chinese researchers are currently trying to build the "Emdrive" (electromagnetic drive), which would change all space propulsion systems in case it becomes functional.

Basically, the technology relies on converting electricity into thrust by means of microwaves, without contradicting the laws of physics. The original idea belongs to British scientist Roger Shawyer and, after the British government seemed to have lost interest in it, it has been bought (read financed) by a Chinese company. Currently, the project is undergoing at the Northwestern Polytechnical University (NPU) in Xi'an, China, under the command of Professor Yang Juan

who has gathered a lot of experience in the field of microwave plasma thrusters, a similar hardware technology based on a different theory.

The engines built by Shawyer's company (Satellite Propulsion Research – SPR) for demonstrative purposes produce thrust by means of a microwave-filled tapering resonant cavity. Australian physicist John Costella says: "It is well known that Roger Shawyer's 'electromagnetic relativity drive' violates the law of conservation of momentum, making it simply the latest in a long line of 'perpetuum mobiles' that have been proposed and disproved for centuries. His analysis is rubbish and his 'drive' impossible." That's an example of how Shawyer's theory is perceived by other experts. But no great idea came to happening without a strong public disbelief and opposition. Some even claim that, although SPR's work is based entirely on Einstein's principles, this particular theory and device type violates Einsteinian physics laws and, as such, it must be false or wrong at some point.

In reply, Shawyer told Danger Room that "NPU started their research program in June 2007, under the supervision of Professor Yang Juan. They have independently developed a mathematical simulation which shows unequivocally that a net force can be produced from a simple resonant tapered cavity. The thrust levels predicted by this simulation are similar to those resulting from the SPR design software, and the SPR test results."

This kind of thrust is sought to be replaced.

Comparisons between the C-Band Emdrive and NASA's NSTAR ion thruster clearly demonstrate the superiority of the former: Emdrive obtains 85 mN of thrust using about 25% of the power that NSTAR uses to produce 92 mN (about a third of an ounce or 9 grams). It also weighs only 7 kg, compared to NSTAR's 30, not to mention the propellant: while NSTAR uses only 10 grams an hour, Emdrive uses... well, none whatsoever, as it relies on energy.

If the technology is proved to work, its applications are fantastic. The endurance of satellites would be enhanced, as well as their maneuverability, eliminating the toxic risk factor along the way. The probes sent into the deep space would exhibit faster speed, longer trek abilities, and they would be able to stop at any time, like when they reach their target or meet something interesting along their journey. Based on Shawyer's calculations, a solar-powered Emdrive thrust would be capable, in theory, to carry a manned mission to Mars in 41 days' time.

---

http://www.eurekamagazine.co.uk/article/9657/No-propellant-drive-prepares-for-space-and-beyond.aspx

No-Propellant Drive Prepares for Space and Beyond

by

Tom Shelley

Tom Shelley reports on progress with the controversial Emdrive and its potential applications in space and on the ground

The Emdrive – originally revealed in Eureka's December 2002 edition as a way of driving satellites and spacecraft using microwaves – is now demonstrating its ability to produce thrust on a consistent basis and is scheduled to be ready for space use by May 2009.

Meanwhile studies are underway into the design of a superconducting version, with a possible thrust of more than 30kN/kW. While it couldn't be used to accelerate a rocket, it might well be able to provide enough static lift for a flying vehicle propelled forward by other means.

Despite massive controversy, the project continues to be backed by DTI and private investors, and has now been shown to work. Roger Shawyer, who spent 20 years at Marconi Space Systems (now EADS Astrium), revealed details of the prototype engine and its development plans to an IEE chapter meeting in Portsmouth, where the audience included many ex-colleagues from his former company.

Shawyer stated that many of the claims he is alleged to have made about the Emdrive are untrue, particularly suggestions that it defies the principles of conservation of momentum, or Newton's Laws of Motion.

The crucial part, as he explained, is that it is a relativistic effect that arises because the waves being reflected at the two ends of the conical cavity into which the microwaves are injected have different effective velocities, and thus different frames of reference, and that a closed microwave wave guide is an 'open system' in terms of relativity. According to Einstein, all moving frames of reference are equivalent. Why this should be so, whether one is standing still or going at half the speed of light, nobody knows, and in effect Shawyer's engine could be chucking Dark Energy out of the back of it and functioning as a conventional rocket. On the other hand, there may be no such thing as Dark Energy, and Shawyer may have stumbled on what is really driving the galaxies apart.

But as he pointed out: "I am just a microwave engineer and all that matters is that it works."
In the present experimental engine and its immediate predecessor, the cavity is made in the form of a copper cone closed off by flat plates at the wide and narrow ends. The net thrust is proportional to the Q value of the cavity, where Q is the ratio of the amount of stored energy to the amount of energy lost per cycle. Acceleration extracts energy from the system and Q decreases. The development engine has a Q value of 50,000 and produces a specific thrust of 0.315N/kW. The original engine produced a thrust of 1.6 grammes, but could only run for tens of seconds at a time before the magnetron overheated and burned out. The present engine produces 9 grammes of thrust from 300W of microwave power and is continually water-cooled. The internal power density is about 17MW.

A video of the demonstration of the engine in its test cell involved mounting the engine and its cooling system on a beam, and supporting it on an air bearing. The test was undertaken in October last year, producing a thrust of 9.8 grammes, maximum speed of 2 cm/s and a movement distance of 185cm. According to Shawyer, the tests had involved accelerating from rest, deceleration to rest, forward and reverse engine mounting, energising at different start angles and using different input powers.

While 9.8 grammes of thrust from a 100kg of machinery may not sound very much, it is a much better power-to-weight ratio than the best competitive satellite and spacecraft propulsion technology, which involves using an ion engine.

For a 1500W DC input power, an ion drive produces 92mN thrust, whereas an Emdrive, based on current technology, should produce 330mN thrust. Furthermore, an ion engine of this size would weigh 112.5kg plus propellant, whereas an Emdrive would weigh 9kg. And while life under power for an ion engine is about six months, an Emdrive should run for 15 years – or virtually forever, if the microwaves were generated by some solid state device.

The big application is for commercial communication satellites – where 'Hotbirds' have a take-off weight of 3 tonnes, of which 1.7 tonnes is propellant – both to get them from Low Earth Orbit to Geostationary and to keep them pointing the right way once they get there. Using Emdrives, says Shawyer, should save £15 billion in launch costs over 10 years. While the thrust from the Emdrive would be small, it should get the satellite from Low Earth to Geostationary

orbit in 36 days. Power would be from 6kW of solar cells fed to Travelling Wave Tube Amplifiers.

But what really captivated the audience was Shawyer's proposal for the next stage, which would be to use a superconducting cavity with a Q value of 5 billion and a thrust of 3 tonnes/kW. Unfortunately, one could not use the device accelerate without "causing the Q value to collapse, losing thrust in that vector", he conceded.

One serious consideration is to develop the technology so that it could be used gently to divert a large asteroid in danger of colliding with the Earth. In fact, prior to Shawyer's address, David Hall from EADS Astrium had discussed the use of microwave technology to study the internals of Near Earth Object asteroids. He said blowing up such a threat, Hollywood-style, was not really practical – the parts would still be likely to hit the Earth. Current ideas were mostly about finding ways of nudging asteroids into a safe trajectory. As acceleration would be so low, a superconducting Emdrive would be a possible option. A 1kW engine would require 24kW to keep it cool and shifting the asteroid would take somewhere in the order of 10 years, depending on its size.

Shawyer said his team was thinking of using superconducting cavities of a type already being developed and manufactured for a major accelerator project, and cooling them with hydrogen. If applied to lifting a vehicle, the boiling off hydrogen could be used to provide horizontal motion by feeding it to conventional turbofan engines, if in the atmosphere, or to rocket engines for use in space. Whether the technology will ever be used to produce hydrogen-propelled air cars or other wonders, only time will tell.

Pointers

Novel non-propellant microwave drive has reached the point where it can be run continuously

Demonstration engine and cooling system weighs about 100kg and produces just under 10 grammes of thrust

Next engine for satellite propulsion should weigh a little less than 10kg and produce 330mN thrust

A superconducting design able to deliver tonnes of lift thrust (but no acceleration) is being studied

---

Criticism

"Why Shawyer's Electromagnetic Relativity Drive is a Fraud" --- John P. Costella: "It is well known that Roger Shawyer's 'electromagnetic relativity drive' violates the law of con-servation of momentum, making it simply the latest in a long line of 'perpetuum mobiles' that have been proposed and disproved for centuries."

PDF : **http://www.assassinationscience.com/johncostella/shawyerfraud.pdf**

Roger Shawyer replies --

"The momentum exchange is between the electromagnetic wave and the engine, which is attached to the spacecraft. As the engine accelerates, momentum is lost by the electromagnetic wave and gained by the spacecraft, thus satisfying the conservation of momentum. In this process, energy is lost within the resonator, thus satisfying the conservation of energy.

"The emdrive concept is clearly difficult to comprehend without a rigorous study of the theory paper, which is available via emdrive.com or the New Scientist website. This paper, which has been subjected to a long and detailed review process by industry and government experts, derives two equations: the static thrust equation and the dynamic thrust equation.

"The law of the conservation of momentum is the basis of the static thrust equation, the law of the conservation of energy is the basis of the dynamic thrust equation. Provided these two fundamental laws of physics are satisfied, there is no reason why the forces inside the resonator should sum to zero.

"The equations used to calculate the guide wavelengths in the static thrust equation are very non-linear. This is exploited in the design of the resonator to maximise the ratio of end plate forces, while minimising the axial component of the side wall force. This results in a net force that produces motion in accordance with Newton's laws."

Penny Gruber (20:23, 29 September 2008 (PDT) -- AFAIK COM has to apply in any inertial frame of reference. Assuming that the microwave cavity is well sealed as it must be for the high Q's Shawyer's system needs, then no microwaves escape. The magnetron, the waveguide to the cavity, the cavity and all the waves that bounce around inside of it are intrinsically in the same frame of reference, with no ejected mass or energy other than heating from the dielectric and conduction losses of the cavity materials. The thruster ejects nothing and so by COM cannot experience any accelerating force in an external FOR.

Patents & Applications

Thrust Producing Device using Microwaves
GB # 2399601
Roger J. Shawyer

Abstract -- A microwave engine, which produces high thrust, may be used to propel spacecraft where the thrust vector is at ninety degrees to the main velocity vector. It may also be used in an airborne vehicle to counteract gravitational force. The engine comprises a gimbal mounted matrix of a number of superconducting microwave thrusters 11 which are supplied with pulses of microwave energy via an array of switches 15 and enclosed in a Dewar 19 which is maintained at low temperature by liquefied gas. The engine may include an automatic control system to maintain the correct frequency of the microwave generator 7, a means 17 of dissipating the stored microwave energy, and a gyroscopic instrument 21 and motors 22,23 for maintaining the axis of thrust parallel to the direction of gravitational acceleration for an airborne vehicle.

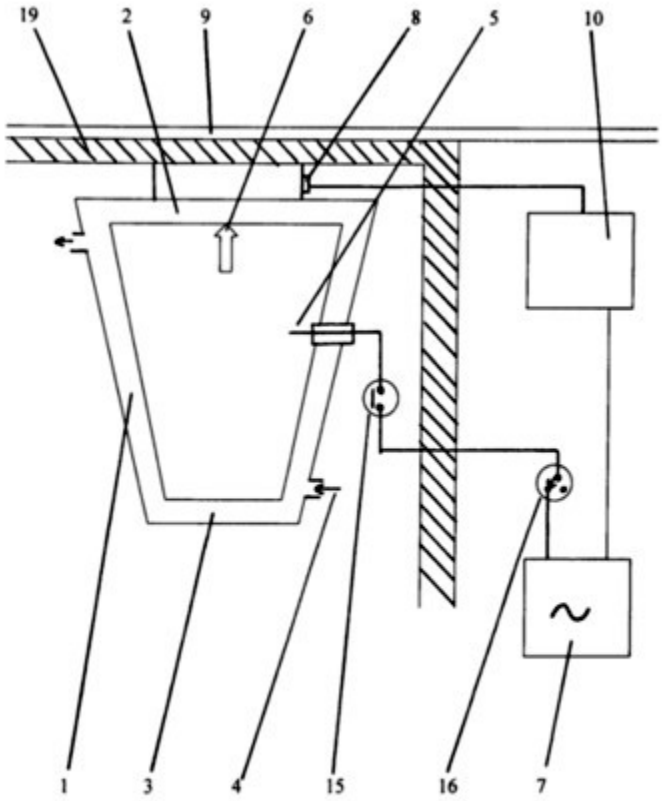


Figure 1

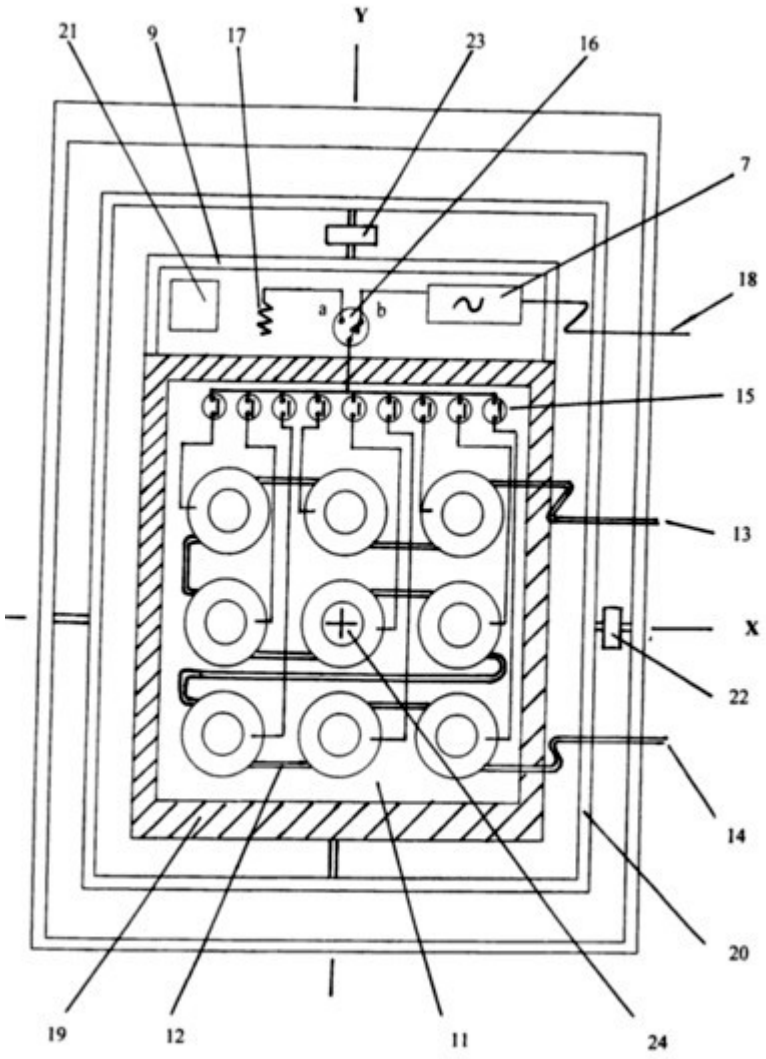


Figure 2

HIGH THRUST MICROWAVE ENGINE

This invention relates to a microwave engine, which produces high thrust and may be used in spacecraft missions where the thrust vector is at ninety degrees to the main velocity vector. It may also be used in an airborne vehicle to counteract gravitational force, thus enabling the vehicle to be moved horizontally or vertically with low levels of auxiliary thrust.

Previously described microwave thrusters used for spacecraft propulsion do not produce the necessary thrust for these applications, as they are designed to provide kinetic energy along the main velocity vector.

The object of this invention therefore is to provide a microwave thruster operating at a very high Q value, such that an engine comprising a number of these thrusters will produce the necessary total thrust.

According to the present invention, there is provided an engine comprising a gimbal mounted matrix of a number of superconducting microwave thrusters, which are supplied with pulses of microwave energy via an array of switches, and enclosed in a dewar, which is maintained at low temperature by liquefied gas.

A specific embodiment of the invention will now be described by way of example, with reference to the accompanying drawings in which:-

Figure 1 shows a schematic diagram of a single thruster.
Figure 2 shows a schematic diagram of the complete engine.

In Figure 1, the inner surface of the tapered waveguide section 1, and the end walls 2 and 3, are coated with a material which exhibits superconducting properties at low temperature. Liquefied gas 4 flows through the hollow walls of the tapered waveguide section 1 and the hollow end walls 2 and 3 to produce a temperature that is low enough to maintain the superconducting properties of the inner coating. A pulse of electrical energy in the form of an electromagnetic wave in the microwave region

of the electromagnetic frequency spectrum is coupled into the tapered waveguide section by means of a slot or probe 5 in the side wall of the waveguide. A force is therefore produced in the direction shown by the arrow 6. This force is given by the general equation:

$$F = \frac{2PQD}{c}, \qquad (1)$$

where F = force (Newtons),

P = input power (Watts),

c = speed of light (metres per second),

D = design factor, dependent on the geometry of the thruster.

The factor Q in equation (1) is the number of multiple reflections at power P which occur when the frequency of the input power equals the resonant frequency of the thruster.

The frequency of the input power may be altered at the microwave generator 7 to closely track any changes in the resonant frequency of the thruster. This is achieved by means of an automatic control system comprising a force sensor 8, mounted on the attachment between the thruster and the engine frame 9, together with a control unit 10. The control unit 10 compares the force measurements from the force sensor 8 for small positive and negative increments in frequency and calculates the optimum frequency for maximum force. This frequency is then maintained until any reduction in force is detected, whereupon the frequency optimisation process is repeated.

The factor Q is given by the equation:

$$Q = \frac{P_c}{P_e}, \qquad (2)$$

where P_c = circulating power (Watts),

P_e = electrical power loss (Watts).

In a superconducting waveguide P_e approaches zero and Q reaches very high values, leading to high levels of force from the thruster. If this force is not used to move the thruster, then no kinetic energy is extracted from the thruster and the Q remains at the very high value, designated Q_u, the unloaded Q. If the force is used to accelerate the thruster, then the Q is reduced to a value designated Q_l, the loaded Q. The value of Q_l may be determined by solving the following equation:

$$\left(\frac{Q_l}{Q_u}\right)^2 + \frac{2Q_l D\bar{v}}{c} = 1, \qquad (3)$$

where $\bar{v}$ is the average velocity reached by the thruster during a period of acceleration, caused by the force F. If the thruster velocity is caused by any means other than the force from that thruster, $\bar{v}$ remains zero and Q_l remains at the same value as Q_u.

Therefore if a spacecraft to which the thruster is attached is travelling at high velocity, operating the thruster with the thrust vector at ninety degrees to the velocity vector will enable an increase in resultant velocity to be achieved with only a small decrease of Q_u, therefore maintaining the required level of force according to equation 1. There are spacecraft missions where such an application of this ninety degree thrust vector is particularly appropriate, including spiral planetary orbits and asteroid deflection. For other missions, operating the thruster with the thrust vector at plus ninety degrees and minus ninety degrees to the velocity vector for alternating periods would enable a resultant velocity increase to be achieved without an unacceptable decrease of Q_u. Such an unacceptable decrease in Q_u would be where the reduction in the resulting force, according to equation 1, was no longer sufficient to give the required acceleration along the thrust vector.

In an airborne vehicle the thruster may be used to counteract gravitational force by aligning the thrust vector with the direction of gravitational acceleration. Provided that the thruster does not significantly contribute to acceleration along the thrust axis, auxilary thrust producing devices will enable the vehicle to be moved horizontally or vertically without an unacceptable decrease of Q_u. Such an unacceptable decrease in Q_u would be where the resulting force, according to equation 1, was no longer sufficient to counteract the gravitational force on the vehicle.

In Figure 2 a number of thrusters are mounted, in layers, on a common structure to form a matrix 11. In Fig 2 only one layer of nine thrusters is shown for clarity. The total thrust from the engine is given by the sum of the forces from each thruster. The thrusters are interconnected by pipes 12, to allow the free flow of liquefied gas which

is supplied via flexible pipes 13 and 14. Each thruster is supplied with microwave energy via feeds from a switch array 15. The input to the switch array 15 is fed from a selector switch 16. One connection to the selector switch 16, namely terminal a, is fed to a resistive load 17, which provides a means to dissipate the total microwave energy, stored in the thruster matrix 11, as heat. The other connection to the selector switch 16, namely terminal b, is the feed from the microwave generator 7, which is itself supplied with d.c. electrical energy via a flexible connection 18. With the selector switch 16 positioned to terminal b, a pulse of microwave energy, at the resonant frequency of the thruster, is fed to each thruster in turn. The thruster is selected by closing the appropriate switch in the switch array 15 for the time required to transmit the pulse. The pulse period is determined by the design of the thruster and Q_u. The amplitude of the power of the pulse is determined by the total thrust required from the engine. To reduce the engine thrust, the selector switch 16 is positioned to terminal a, and the appropriate switches in the array 15 are closed for a time required to transmit stored energy in the thrusters to the load 17. The thruster matrix 11 and switch array 15 are enclosed in a dewar 19, which is highly insulated to minimise heat flow. The dewar 19, selector switch 16, load 17 and microwave generator 7 are attached to the engine frame 9.

The engine frame 9 is mounted to the body of the spacecraft or airborne vehicle by a gimbal mechanism 20. In a spacecraft, this mechanism enables the thrust vector to be altered independently of the velocity vector. In an airborne vehicle, the attitude of the engine frame 9 may be measured, in both X and Y axes, by a gyroscopic instrument 21, with reference to the direction of gravitational acceleration, i.e. the local vertical. Signals from the gyroscopic instrument 21, which is attached to the engine frame 9, are used to drive the gimbal mechanism 20 in the X axis, by a control motor 22, and in the Y axis by a control motor 23. In this manner the axis of thrust of the engine is maintained parallel to the direction of gravitational acceleration. The centre of gravity of the engine and that of the vehicle to which it is attached, is along the centre line 24 of the Z axis of the thruster matrix 11. Multiple engines may be employed in vehicles with variable centres of gravity. Horizontal or vertical movement of the vehicle is provided by auxiliary thrusters.

Microwave Thruster for Spacecraft
UK Patent Application GB # 2334761
Roger J. Shawyer

Abstract -- The thruster comprises a tapered waveguide comprising a section 1, that is evacuated or filled with air, and a section 6 containing a dielectric resonator or ferrite material whose relative permeability or relative permittivity (or both) have values greater than unity. Microwaves may be introduced into the guide via a slot 2, or a probe. It is stated that the force 9, on the end wall 5, due to reflection of the microwaves, is less than the force 4, exerted on the end wall 3, thereby generating a resultant propulsive thrust. The thruster may be used to enable the orbit of a spacecraft to be maintained or changed over a period of time.

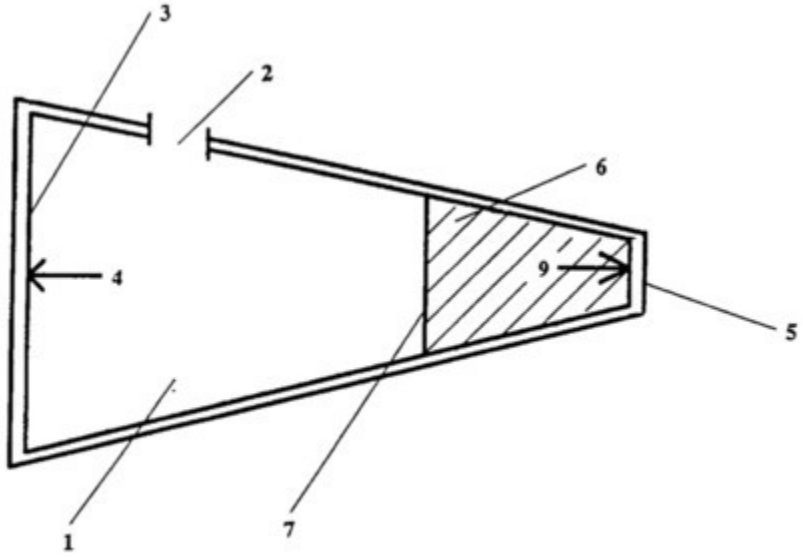


FIGURE 1

2334761

MICROWAVE THRUSTER FOR SPACECRAFT

This invention relates to a microwave thruster for use on spacecraft.

The thruster is used for maintaining or changing the orbits of spacecraft by applying low levels of thrust over long periods of time. It may also be used to change the attitude of the spacecraft.

According to the present invention there is provided a thruster which will generate thrust when supplied with electrical energy at the appropriate frequency, typically in the microwave region. The electrical energy will cause electromagnetic waves to be propagated in the thruster which comprises a shaped resonant waveguide assembly. The assembly includes both an air or vacuum filled section and a section continuing a dielectric resonator or ferrite material. The force resulting from reflections of the guided electromagnetic waves in the section containing a dielectric resonator or ferrite material will be less than the force resulting from reflections in the air or vacuum filled section. The difference between these forces will give rise to a resultant thrust.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing, Figure 1, which shows a schematic diagram of the thruster.

Electrical energy of appropriate frequency is coupled into an air or vacuum filled section of waveguide 1 by means of a slot or probe 2 depending on the required interface with the energy source. For a standard rectangular waveguide interface with the source, a slot is most suitable for coupling to a circular thruster waveguide, enabling a TM01 mode to be propagated through the thruster waveguide. The energy propagates along the waveguide as an electromagnetic wave and is reflected at one end of the air or vacuum filled section by an end wall 3. Reflection of the electromagnetic wave causes a force to be produced on the end wall 3 in the direction of the arrow 4. The electromagnetic wave also propagates towards the other end wall 5. As the wave propagates towards end wall 5, the cross section of the waveguide decreases and the wave enters a Section 6 containing an electrical material.

Thus for waveguide of circular configuration the diameter would decrease from diameter d_1 at end wall 3 to diameter d_2 at end wall 5.

The electrical material will have a relative permeability higher than unity or a relative permittivity higher than unity or both relative permeability and relative permittivity higher than unity. The electrical material will also exhibit low electrical losses. Such an electrical material may be selected from dielectric resonator materials or from ferrite materials. For a thruster operating at 2000 Mhz utilising TM01 mode, a suitable material is a dielectric resonator of relative permittivity value 38.

The dimensions of the waveguide are such that, at the interface 7, between section 1 and section 6, the characteristic impedance of the wave in section 1 is identical to the characteristic impedance of the wave in section 6. This ensures that the wave propagates from section 1 to section 6 and also from section 6 to section 1 without reflection. For a circular waveguide the diameter at the interface would be d_3.

The electromagnetic wave is reflected at the end wall 5 and produces a force on the end wall 5 in the direction of the arrow 9. This force is less than the force at the end wall 3 by a factor dependent on the relative permeability and relative permittivity of the electrical material and by the dimensions of the waveguide at end wall 3 and end wall 5.

The reduction in force at end wall 5 is a result of the decrease in momentum of the electromagnetic wave as the propagation velocity decreases from section 1 to section 6. The decrease in velocity occurs due to two effects.

The first effect is a decrease in propagation velocity due to the increased relative permeability or due to the increased relative permittivity or due to the increase of both relative permeability and relative permittivity of the electrical material in section 6. For a dielectric resonator material of relative permittivity e_r the propagation velocity is decreased by a factor of $\sqrt{e_r}$.

The second effect is a reduction in the group velocity of the electromagnetic wave due to the increase in guide wavelength as the cross section of the waveguide is decreased. Thus for circular waveguide the group velocity in Section 1 decreases as the diameter decreases from d_1 to d_3 and in Section 2 the group velocity decreases as the diameter decreases from d_3 to d_2.

The electrical material will have a relative permeability higher than unity or a relative permittivity higher than unity or both relative permeability and relative permittivity higher than unity. The electrical material will also exhibit low electrical losses. Such an electrical material may be selected from dielectric resonator materials or from ferrite materials. For a thruster operating at 2000 Mhz utilising TM01 mode, a suitable material is a dielectric resonator of relative permittivity value 38.

The dimensions of the waveguide are such that, at the interface 7, between section 1 and section 6, the characteristic impedance of the wave in section 1 is identical to the characteristic impedance of the wave in section 6. This ensures that the wave propagates from section 1 to section 6 and also from section 6 to section 1 without reflection. For a circular waveguide the diameter at the interface would be d_3.

The electromagnetic wave is reflected at the end wall 5 and produces a force on the end wall 5 in the direction of the arrow 9. This force is less than the force at the end wall 3 by a factor dependent on the relative permeability and relative permittivity of the electrical material and by the dimensions of the waveguide at end wall 3 and end wall 5.

The reduction in force at end wall 5 is a result of the decrease in momentum of the electromagnetic wave as the propagation velocity decreases from section 1 to section 6. The decrease in velocity occurs due to two effects.

The first effect is a decrease in propagation velocity due to the increased relative permeability or due to the increased relative permittivity or due to the increase of both relative permeability and relative permittivity of the electrical material in section 6. For a dielectric resonator material of relative permittivity e_r the propagation velocity is decreased by a factor of $\sqrt{e_r}$.

The second effect is a reduction in the group velocity of the electromagnetic wave due to the increase in guide wavelength as the cross section of the waveguide is decreased. Thus for circular waveguide the group velocity in Section 1 decreases as the diameter decreases from d_1 to d_3 and in Section 2 the group velocity decreases as the diameter decreases from d_3 to d_2.

The difference in the forces exerted on the two end walls 3 and 5 will give rise to a resultant force on the thruster unit in the direction of the arrow 4.

This force is given by the equation

$$F = \frac{2P}{C}\left(\frac{\lambda_1}{\lambda_{g1}} - \frac{\lambda_2}{\lambda_{g2}\sqrt{e_r}}\right) \qquad - \qquad (1)$$

where

F	=	Resultant force (Newtons)
P	=	Input power (watts)
C	=	Speed of light (m/sec)
λ_1	=	free space wavelength (m)
λ_2	=	unbounded wavelength in Section 6 (m)
λ_{g1}	=	guide wavelength at end wall 3 (m)
λ_{g2}	=	guide wavelengh at end wall 5 (m)

It may be seen from equation (1) that to obtain a force F, the ratio of the free space wavelength to guide wavelength at the end wall 3 must be greater than the ratio of the unbounded wavelength to guide wavelength at the end wall 5 divided by the square root of the relative permittivity of the dielectric.

It may be noted that for circular waveguide, λ_{g1} is dependent on diameter d_1 and λ_{g2} is dependent on on diameter d_2. To maximise the force F these diameters would be chosen within practical constraints to minimise λ_{g1} and to maximise λ_{g2} whilst the value of e_r is maximised consistent with acceptable electrical losses.

The overall length of the two sections of waveguide 1 and 6 will be a multiple of half the effective wavelength of the applied electrical energy, to enable a resonant state to be established. The total resultant force due to the multiple reflections will be increased by a factor dependent on

the electrical losses occurring in the waveguide assembly. This factor may be designated the Q factor of the resonant waveguide.

Thus the total thrust generated by the multiple reflections in the unit designated F_T is given by the equation:

$$F_T = \frac{2PQ}{C}\left(\frac{\lambda_1}{\lambda_{g1}} - \frac{\lambda_1}{\lambda_{g2}\sqrt{e_r}}\right) \quad - \quad (2)$$

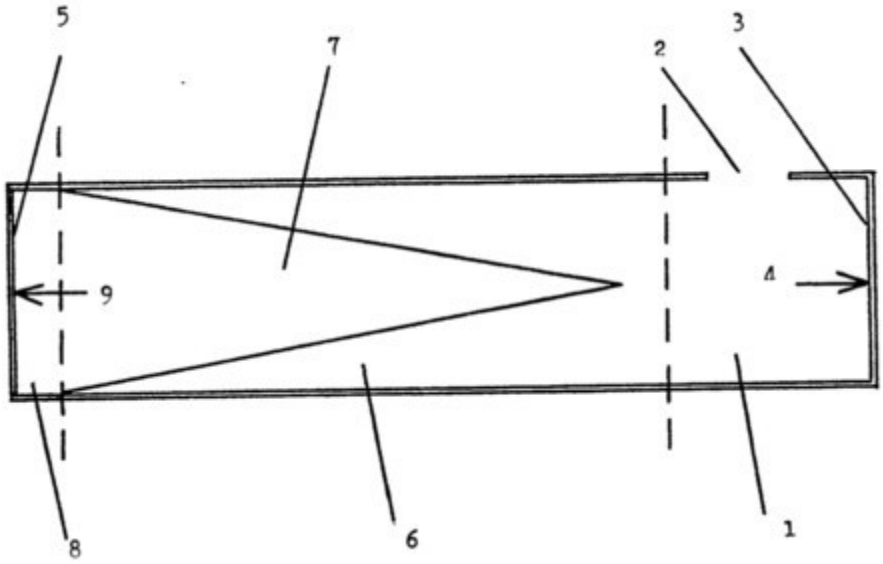
The thrust generated by the unit, due to the total resultant forces, produced as described, can be transmitted to a spacecraft by mechanically fixing the unit together with its source of electrical energy, to the spacecraft structure.

The momentum transferred to the spacecraft by the thruster is equal to the total sum of the momentum changes in the electromagnetic wave at the end walls, thus satisfying the law of conservation of momentum.

The energy lost in the thruster due to electrical losses is less than the energy input to the thruster, by a value equal to the kinetic energy transferred by the thruster to the spacecraft, thus satisfying the law of conservation of energy.

Electrical Propulsion Unit for Spacecraft
UK Patent Application GB # 2229865
Roger J. Shawyer

Abstract -- A unit which will generate thrust when provided with electrical energy at the appropriate frequency. This will enable the orbit of a spacecraft to be maintained or changed when applied over a period of time. The thrust is generated as a result of the difference in the forces obtained when electromagnetic waves are reflected at the end walls 3 and 5 of a resonant waveguide assembly. This assembly comprises an air or vacuum filled end section 1 together with a transition section 6 and an end section 8 containing an electrical material 7.


5
7
2
3
9
4
8
6
1

ELECTRICAL PROPULSION UNIT FOR SPACECRAFT

This invention relates to an electrical propulsion unit for use on spacecraft.

Electrical propulsion is used for maintaining or changing the orbits of spacecraft by applying low levels of thrust over long periods of time.

According to the present invention there is provided a unit which will generate thrust when supplied with electrical energy at the appropriate frequency. The electrical energy will cause electromagnetic waves to be propagated in the unit which comprises a resonant waveguide assembly. The assembly includes both an air or vacuum filled end section and an end section containing an electrical material. The force resulting from reflections of the guided electromagnetic waves in the end section containing the electrical material will be greater than the force resulting from reflections in the air or vacuum filled end section. The difference between these forces will give rise to a resultant thrust on the unit.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing, Figure 1, which shows a schematic diagram of the propulsion unit.

Electrical energy of appropriate frequency is coupled into an air or vacuum filled end section of waveguide 1 by means of a slot or probe 2 depending on the required interface with the energy source. This energy propagates along the waveguide as an electromagnetic wave and is reflected at one end of the air or vacuum filled section by an end wall 3. Reflection of the electromagnetic wave causes a force to be produced on the end wall 3 in the direction of the arrow 4. The electromagnetic wave also propagates towards the other end wall 5 via a transition section 6, containing a shaped element 7 made of an electrical material.

This electrical material will have a relative permeability higher than unity or a relative permittivity higher than unity or both relative permeability and relative permittivity higher than unity. The electrical material will also exhibit low electrical losses. Such an electrical material may be selected from dielectric resonator materials or from ferrite materials.

After propagating along the transition section, the electromagnetic wave enters an end section 8, filled with the electrical material and terminated with an end wall 5. The transition section will be of sufficient length and will contain a suitably shaped element, to enable propagation of the electromagnetic wave to be transferred from the end section 1 to the end section 8, or from the end section 8 to the end section 1, without causing significant reflections of the electromagnetic wave.

The electromagnetic wave is reflected at the end wall 5 and produces a force on the end wall 5 in the direction of the arrow 9. This force is greater than the force at the end wall 3 by a factor dependent on the relative permeability and relative permittivity of the electrical material. The difference

in the forces exerted on the two end walls 3 and 5 will give rise to a resultant force on the propulsion unit in the direction of the arrow 9.

The overall length of the three sections of waveguide 1, 6 and 8 will be a multiple of half the effective wavelength of the applied electrical energy, to enable a resonant state to be established. The total resultant force due to the multiple reflections will be increased by a factor dependent on the electrical losses occurring in the waveguide assembly .

The thrust generated by the unit, due to the total resultant forces, produced as described, can be transmitted to a spacecraft by mechanically fixing the unit together with its source of electrical energy, to the spacecraft structure.

Digitally Controlled Beam Former for a Spacecraft
USP # 5543801
Roger J. Shawyer

Abstract -- A digitally controlled beam former for a spacecraft which includes means for periodically calibrating the feed paths of the spacecraft's antenna array by measuring the apparent movement of the center of a reference signal and a nominal signal and utilising the measured data to compensate for at least the phase drift in the antenna feed paths. The measured data may also be used to compensate for amplitude and phase drift in the antenna feed paths.

Also published as: EP0642191 (A1) // GB2281660 (A)

Current U.S. Class: 342/354 ; 342/174; 342/372
Current International Class: H01Q 3/26 (20060101); H04B 007/185 ()

References Cited [Referenced By]
U.S. Patent Documents

3964065 June 1976 Roberts et al.
4280128 July 1981 Masak
4628321 December 1986 Martin
4947176 August 1990 Inatsune
4983981 January 1991 Feldman
5038146 August 1991 Troychak et al.
5093667 March 1992 Andricos
5184137 February 1993 Pozgay
5353031 October 1994 Rathi

Foreign Patent Documents

0452970A3 Oct., 1991 EP
4218371A1 Dec., 1992 DE

Description

BACKGROUND OF THE INVENTION

The invention relates to a digitally controlled beam former for a spacecraft.

There is a requirement in spacecraft for active arrays for both beam forming and null operation. The key component of these active array subsystems is a digitally controlled beam former in which variation of amplitude and phase of the individual antenna elements of the spacecraft's antenna array is effected under digital control.

Experience gained from existing spacecraft highlights the difficulties of maintaining phase and amplitude calibration over the life and temperature of x-band digitally controlled beam formers. The requirements of null generation gives rise to a tight specification for these parameters and thereby temperature control within the limits .+-.2.degree. C.

With a relatively large number of antenna array elements and spot beams, thermal control of the beam formers will be difficult to attain and will probably not, therefore, be an acceptable method of controlling phase and amplitude calibration of the beam forming elements.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a digitally controlled beam former for a spacecraft in which each of the N-paths of the beam former for each element of the spacecraft's receive and transmit antenna arrays is periodically calibrated against a secure tracking telemetry and command (TT&C) uplink. This calibration process not only addresses the major design problem of amplitude and drift in the antenna element feed paths but can also provide the spacecraft with a secure pointing reference which can be utilised to provide back up attitude and orbit control system (AOCS) data in the event that the main optical sensors are disabled for any reason.

The invention provides a digitally controlled beam former for a spacecraft having a multi-element antenna array and a control processor for the antenna array, the beam former including means for periodically calibrating the feed paths of the spacecraft's antenna array by measuring the apparent movement of the centre of a reference signal and a nominal signal and utilising the measured data to compensate for phase drift in the antenna feed paths. The measured data may also be used to compensate for amplitude and phase drift in the antenna feed paths.

According to one embodiment of the invention a digitally controlled beam former is provided wherein the spacecraft has N-paths containing amplitude and phase control elements for each element of the spacecraft's antenna array, wherein the antenna array processor has a number of outputs, each one of which is connected to a separate one of the N-paths for controlling the weighting applied to the amplitude and phase signals of the respective paths; and wherein the beam former includes N-beam former channels, each one of which is connected to a corresponding one of the N-paths of each of the antenna elements; and means for sequentially selecting and calibrating each of the N-channels while the other channels are operational, the weightings of the signals applied to the amplitude and phase elements of the corresponding one of the N-paths of each of the antenna elements being varied in dependence upon the difference between the initial weightings and the weightings required for a reference beam.

According to a further embodiment of the present invention a digitally controlled beam former is provided wherein the antenna array is a receive array and wherein each of the sequentially

selected N-channels is calibrated in response to the receipt of a reference uplink signal from a ground transmitter of known location, the reference signal being applied to the corresponding one of the N-paths of each of the antenna elements and causes reference amplitude and phase signals indicative of the location of the source of the reference signal, to be applied thereto, any offset in both the X and Y phases of the reference beam relative to a nominal beam position being detected and applied to the antenna array processor for causing the weightings of the output signals thereof to be varied in dependence upon the level of the detected offset.

The calibration procedure for the receive array is a two stage process, wherein the reference beam for the first stage is a spread spectrum uplink signal which is received by sweeping a wide receive beam in both X and Y co-ordinates by the receive antenna to establish a coarse boresight for nominal signal weightings, and wherein the same reference beam is used for the second stage and is received by sweeping a narrow beam in both X and Y co-ordinates by the receive antenna to obtain characteristic slopes and offsets for storage by the antenna array processor and thereby variation of the corresponding signal weightings. The narrow beam may incorporate a coarse fixed offset corresponding to the offset in the X and Y phases for the coarse boresight.

According to another embodiment of the present invention a digitally controlled beam former is provided wherein the antenna array is a transmit array, wherein a reference channel is established to provide nominal coverage over a ground station, wherein a reference signal is transmitted from the spacecraft, through the reference channel, to the ground station, the reference signal being modulated by a recognition code, wherein the reference signal is swept over the ground station by the application of control signals to the amplitude and phase control elements of the N-paths of the reference channel by the antenna array processor, and wherein the signal level data received by a calibration beacon of the ground station is uplinked to, and stored by, the antenna array processor for effecting optimisation of the signal weightings applied to the reference channel and the sequential calibration of the other channels of the transmit array utilising the calibration beacon.

The calibration means for the receive and transmit arrays include switching means for each of the N-beam former channels, the switching means being adapted under the control of the antenna array processor to sequentially connect each of the channels to the reference uplink signal for calibration while the other channels are operational. The switching means for the operational channels are change over switches and the switching means for the calibration channel is a n-way switch. The switching means can be provided by high speed switch diodes, preferably in the form of monolithic microwave integrated circuits.

According to another embodiment of the present invention a digitally controlled beam former is provided which includes means for switching operation of the attitude and orbit control system (AOCS) for the spacecraft to the receive antenna array calibration means in the event of failure of the AOCS sensors, the reference channel of the calibration means being used as the AOCS channel, wherein the correlator ensures that only a spread spectrum tracking telemetry and command uplink signal from the ground station is monitored by the detector and wherein the X and Y co-ordinate data for the AOCS is provided by the antenna array processor.

The foregoing and other features according to the present invention will be better understood from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 diagrammatically illustrates a digital beam former for a spacecraft, in the form of a block diagram;

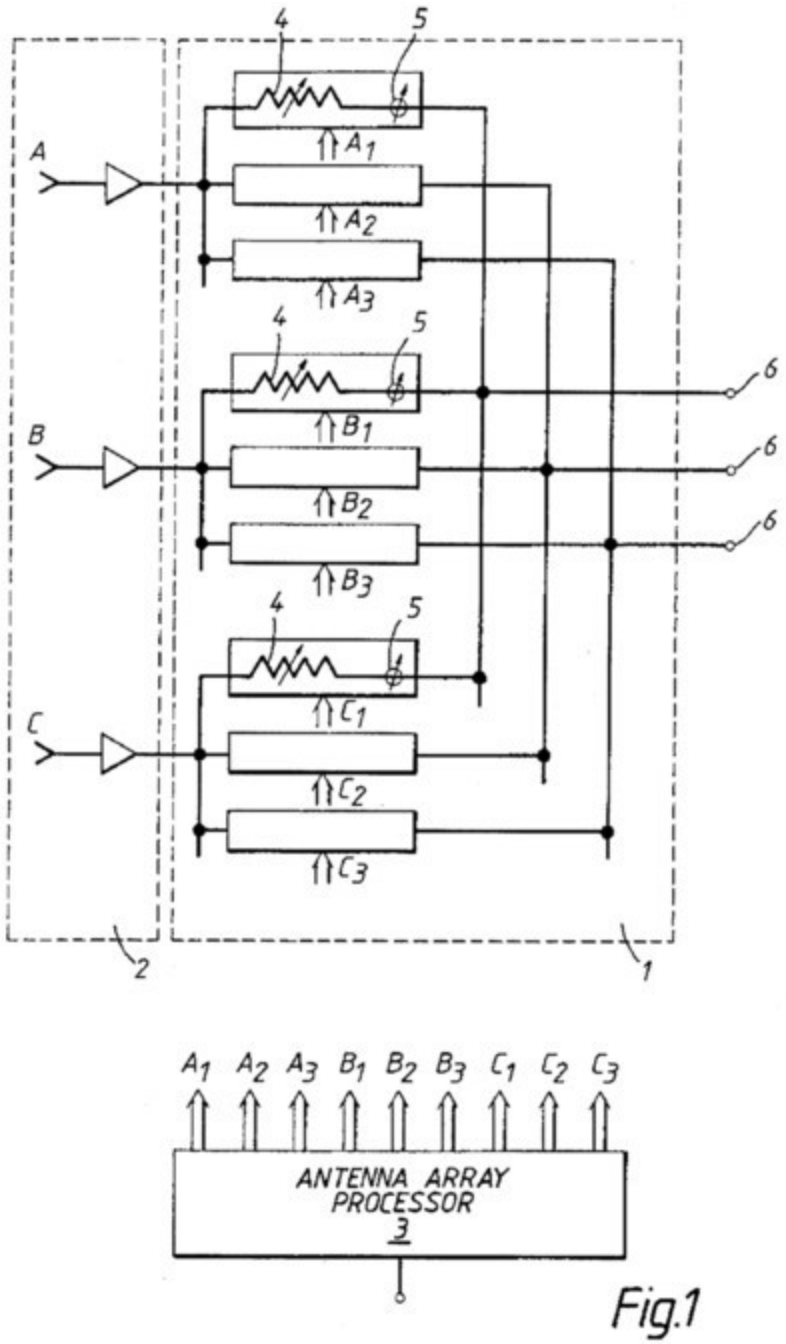


Fig.1

FIG. 2 diagrammatically illustrates, in the form of a block diagram, a digital beam former according to the present invention for the receive antenna array of a spacecraft;

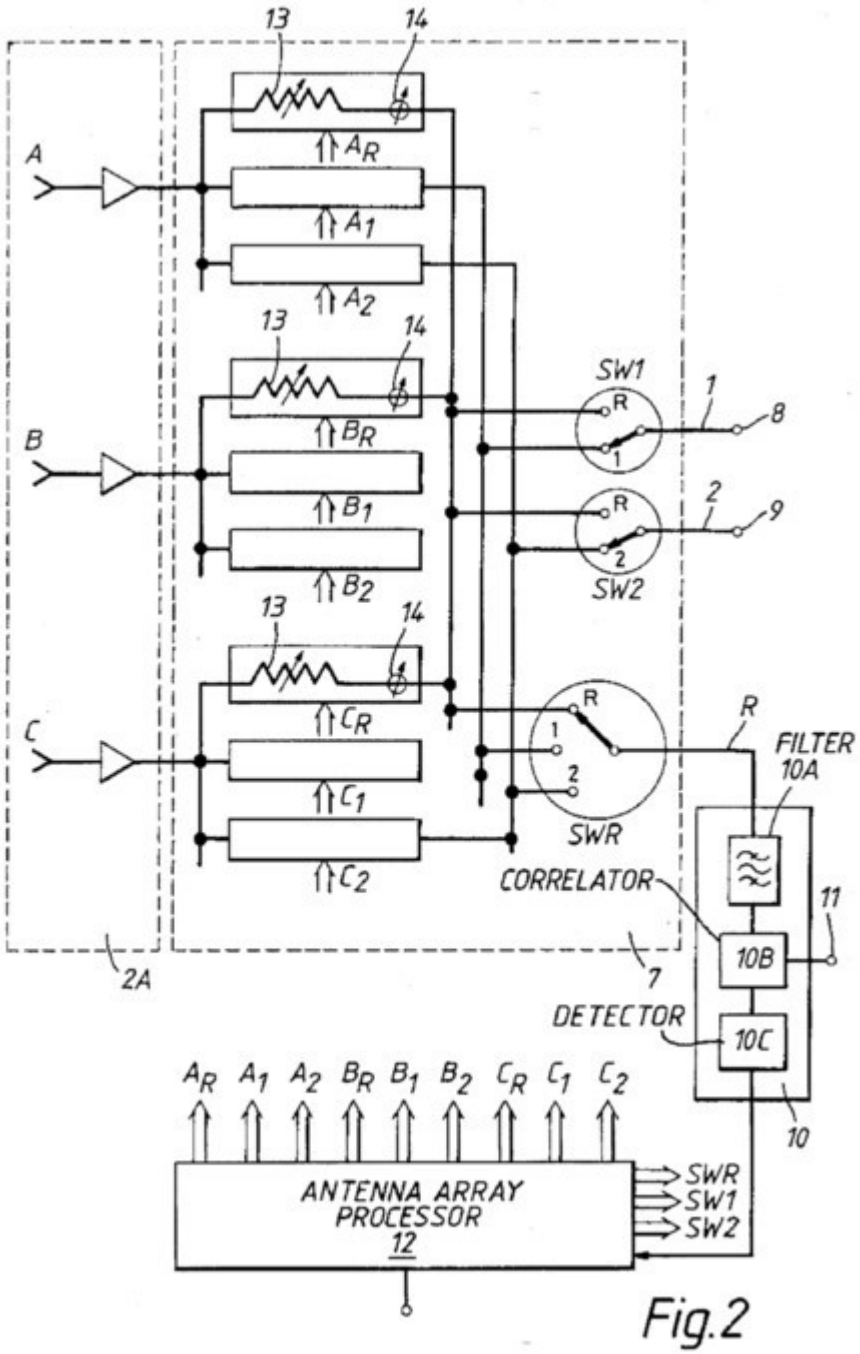


Fig.2

FIG. 3 diagrammatically illustrates, in the form of a block diagram, a digital beam former according to the present invention for the transmit antenna array of a spacecraft; and

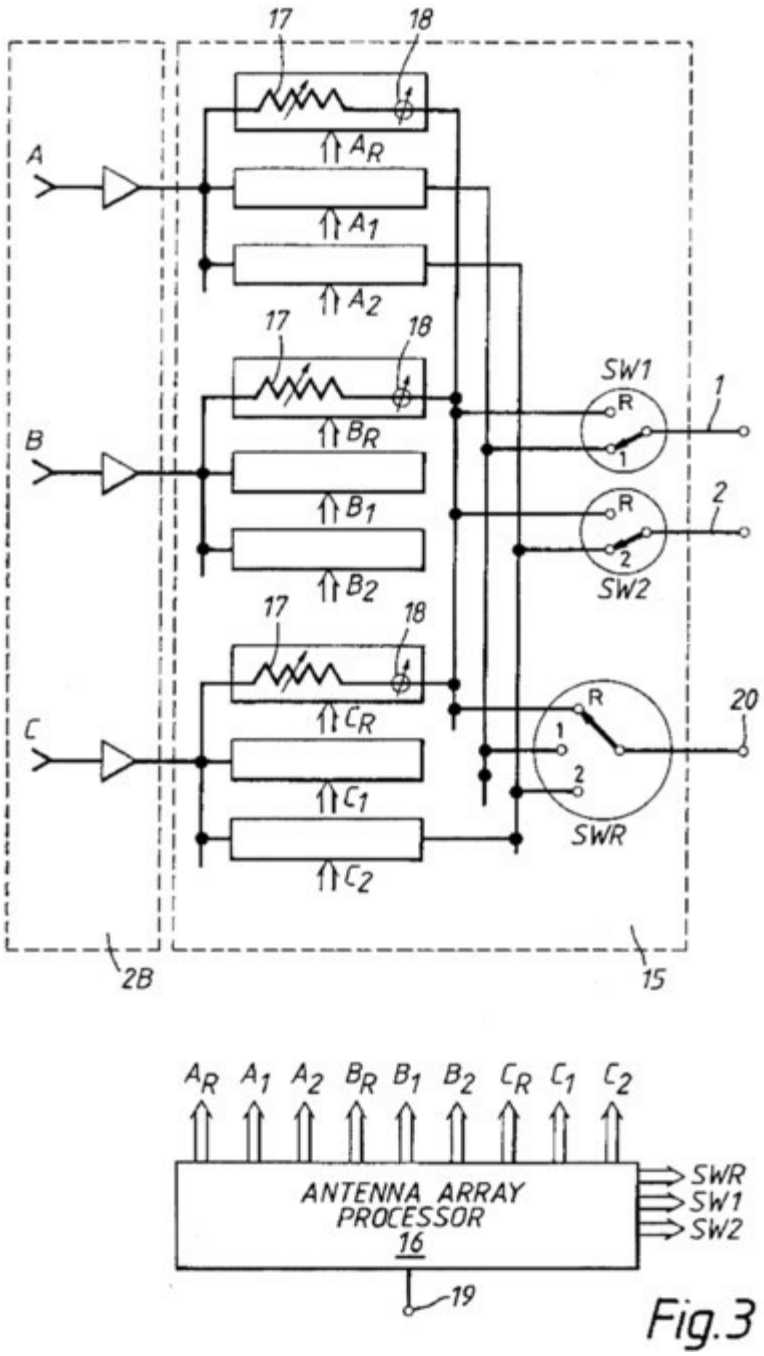


Fig.3

FIG. 4 diagrammatically illustrates, in the form of a block diagram, the digital beam former illustrated in FIG. 2 adapted for operation in AOCS mode.

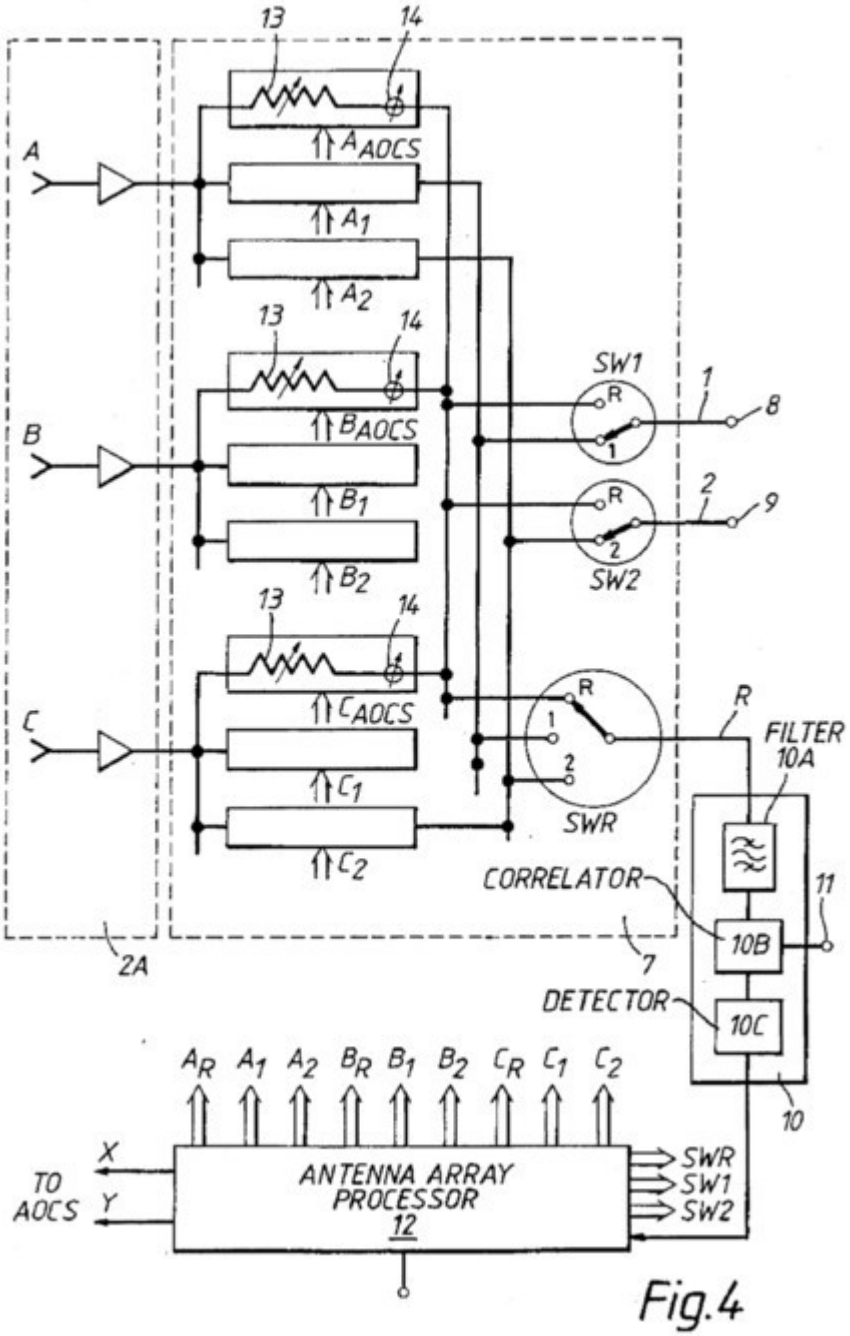


Fig.4

DETAILED DESCRIPTION OF THE INVENTION

As is diagrammatically illustrated in FIG. 1 of the drawings, a digital beam former includes a beam forming network 1 having N-paths (1,2,3 . . . N) for each element (A, B and C) of the antenna array 2 of the spacecraft. Corresponding ones of the N-paths of each of the antenna elements (A,B,C) are connected to separate ones of a number of beam former channels 6. Each of the N-paths is connected to a separate one of the outputs (A.sub.1 . . . A.sub.N, B.sub.1 . . . B.sub.N, C.sub.1 . . . C.sub.N) of an antenna array processor 3 for controlling the weighting of the signals applied to the amplitude (4) and phase (5) control elements of the respective paths (A1,A2 . . . AN, B1,B.sub.2 . . . BN, C1,C.sub.2 . . . CN). The signal weightings for each

element of a beam are indicative of the location on the Earth to which the antenna array is pointing. Hence, calibration of the N-paths can be effected using these weightings for a specific location or region of the Earth. Only three paths are illustrated for each of the antenna elements A, B and C but, it will be directly evident to persons skilled in the art, that any number of paths, channels and antenna elements could be employed in dependence upon the specific requirements of the spacecraft's antenna array.

The antenna elements (A,B and C) include either low noise amplifiers (LNA's) for the receive arrays, or solid state power amplifiers (SSPA's) for the transmit arrays. The phase and gain of each of these elements together with their connecting cables must be calibrated.

The antenna array elements (A, B and C) are adapted to establish beams or nulls for each of the channels 6 which may then be allocated to particular uplink, or downlink, users by the on board switching subsystem (not illustrated). The beamwidths, or null depths, and their position on the Earth are generated by the different weightings applied to the amplitude and phase control signals.

Thus, a reference uplink will require reference weightings to be applied to achieve maximum received signal level. Variation of these weightings in a calibration routine will enable the reference beam on the spacecraft to be shifted in both X and Y phases. The variation in signal level will then enable on-board software to establish any offset from the nominal beam position that is required to counter drift in the amplitude and phase of the elements in the reference path.

These offsets can then be applied to any other beam or null requirements, either as a fixed offset, or as a function derived from the slope of the characteristic obtained during the calibration routine.

As, and when, one `reference` channel is calibrated, it can be switched, in turn, to carry the traffic on each of the operational channels, whilst the elements of that channel are calibrated.

The calibration process referred to above is continuous with each channel being cycled through the calibration routine periodically, enabling short term temperature variations to be compensated.

The periodic calibration arrangement for a receive array 2A is diagrammatically illustrated, in the form of a block diagram, in FIG. 2 of the drawings. The basic structure of the beam forming network 7 of FIG. 2 is the same as the beam forming network 1 of FIG. 1 but, for the purposes of the description, only some of the connections are illustrated. In addition, one of the three channels is designated as a reference channel `R`.

As with FIG. 1, the receive array beam former is, for the sake of simplicity, shown with three N-path channels and three corresponding antenna array elements (A, B and C) only.

As is illustrated in FIG. 2, the operational channels 1 and 2 respectively include change over switches SW1 and SW2 for connecting the channel output terminals 8 and 9 either to the N-paths (AR, BR and CR) of the reference channel `R`, or one of the other channels. In the case of channel 1, the N-paths are (A1, B1 and C1) and in the case of channel 2, the N-paths are (A2, B2 and C2).

In practice, the change over switches SW1 and SW2 can be provided by high speed switch diodes, i.e. PIN diodes, in the form of monolithic microwave integrated circuits (MMIC).

The reference channel R is switched through an n-way selector switch SWR to a simple correlation/detector unit 10 comprising a filter 10A, correlation circuit 10B and detector circuit 10C connected in series between the reference channel R and an input of an antenna array

processor 12. The correlation circuit 10B is connected to an input terminal 11 and the switches SW1, SW2 and SWR are each connected to separate outputs of the processor 12.

In operation, a synchronised key code from a secure processing system (not illustrated) is applied to the unit 10 via the input terminal 11 to enable correlation with the x-band command signal to be effected. The output of the detector circuit 10C is applied to the processor 12 which controls the calibration routines and the application of control signals AR, A1, BR, B1 etc to respective ones of the amplitude (13) and phase (14) control elements of the N-paths of each of the antenna elements (A, B and C).

The processor 12 also controls the calibration cycle by providing switching signals to the switches SW1, SW2 . . . SWR.

In practice, the processor 12 will, as part of the onboard autonomy of the spacecraft, contain stored data for beam forming and null pattern generation in the form of sets of control words for each channel, for example, A1, B1, C1 etc for channel 1. The control word values are varied according to the null or beam required.

In operation, the initial calibration of the reference channel R is carried out by processor 12 causing switch SWR to be set to position R, SW1 to be set to position 1, SW2 to be set to position 2 etc.

A coarse measurement is made at the commencement of the calibration routine using a spread spectrum uplink signal centred on the nominal position of the control ground station. A wide receive beam is swept in both X and Y co-ordinates by the receive antenna and a coarse boresight is established for the nominal control words, i.e. nominal signal weightings. A narrow beam is then set up incorporating, if necessary, a coarse fixed offset. The X and Y sweeps by the receive antenna are then repeated and characteristic slopes and offsets are stored. Control word offsets are then determined for each beam, or null, and are designated .DELTA.AR .DELTA.BR etc. The control words for the reference channel would, therefore, become:

On completion of the reference channel calibration process, the calibration of the first operational channel, i.e. channel 1 of FIG. 2, is then started by changing the reference channel control words for those used for the nominal channel 1 i.e. A1 B1 C1 etc.

Thus, having set up the reference path to Channel 1, the processor 12 causes switch SW1 to be switched to position R to maintain traffic, whilst switch SWR is switched to position 1 to enable channel 1 calibration to take place. The calibration procedure for channel 1 is exactly the same as the procedure used for the calibration of the reference channel R. The resulting offsets and slopes are stored in the array processor 12.

Based on this stored data, the corrections needed for the actual channel 1 operational settings are then determined and the control words are set up as follows:

The switch SW1 is then returned to position 1 by the processor 12 with traffic now being allowed to flow through the calibrated pathway whilst channel 2 is set up and calibrated in a similar manner.

The calibration procedures outlined above can be used to calibrate beam forming networks with any number of channels and antenna elements. The cycle time of the calibration process increasing with system complexity.

The periodic calibration arrangement for a transmit antenna array 2B is diagrammatically illustrated, in the form of a block diagram, in FIG. 3 of the drawings. The basic structure of the beam forming network 15 of FIG. 3 is the same as the beam forming network 7 of FIG. 2 and, as

with FIGS. 1 and 2, only three N-path channels and three corresponding antenna array elements (A, B and C) are shown for the sake of simplicity.

The transmit beam former calibration procedures are basically the same as the calibration procedures for the receive beam former, but involve active participation of the control ground station (not illustrated) and the detector is part of the ground station equipment.

The transmit antenna array processor 16 is used to effect operation of the switches SW1, SW2 and SWR and to apply the weighted signals (AR, A1 . . . etc) to the corresponding amplitude (17) and phase (18) control elements of the N-paths of each antenna element (A, B and C).

A reference channel R is first set up to provide nominal coverage over the ground station. A beacon signal is then transmitted from the spacecraft to the ground station. This signal which is transmitted through the reference channel is modulated by a simple recognition code. The beam is swept by on-board generated control signals to the amplitude (17) and the phase (18) control elements, with detection data being measured on the ground. The received signal level data is then uplinked over the secure command link 19 to the processor 16 and the reference channel is optimised.

As with the receive beam former of FIG. 2, the reference channel path is then cycled, in turn, through the operational channels (1, 2, . . . etc). The operational channel paths are then calibrated using the calibration beacon with the resulting slope and offset data being calculated and stored in the array processor 16. As the required beams are selected, the appropriate offsets are calculated for the control words and the beams set up accordingly.

The transmit calibration routine will of necessity be slower than the receive calibration routine, due to the time delay inherent in transmitting signal level data from the ground station. Since a spot transmit beam can be used, the total transmit power required for the calibration beacon will be minimal, the control ground station will have a good Gain/Temperature performance and the beacon is narrow band.

The AOCS, referred to above, normally relies on input data from optical sensors, typically infra red sensors, to provide a reference to establish the attitude of the spacecraft. With infra red sensors, the edge of the Earth is detected and used as a reference point for the AOCS.

However, in the event that such sensors are disabled for any reason, then control of the spacecraft would be seriously impaired, if not, totally lost. It is, for these reasons, that much effort is being directed towards overcoming these problems.

It has been recognised that it may not be possible to make spacecraft completely immune from laser attack and alternative spacecraft altitude and orbit control systems have been proposed.

Since the calibration procedure of the present invention effectively measures the movement of boresight from the uplink transmitter position, for whatever reason, it can, therefore, be used to continuously update the AOCS with X and Y co-ordinate data. The beamwidth of this control beam can be extended to beyond Earth cover for coarse positioning data, or reduced to the minimum spot size for fine position control.

Thus, the periodically calibrated receive beam former of FIG. 2 can be modified in the manner diagrammatically illustrated, in the form of a block diagram, in FIG. 4 of the drawings for operation in the AOCS mode. The reference channel R is used as the AOCS channel.

As stated above, the basic application of the periodically calibrated beam former of FIG. 2 is to compensate for amplitude and phase drift in the antenna feed paths by measuring the apparent movement of the centre of the TT&C uplink beam from its transmitter position on the Earth.

This movement could equally be caused by a change in the altitude of the spacecraft if the normal AOCS sensors are subject to interference.

Thus, in the event that the AOCS sensors are disables for any reason, the apparent shift resulting from the calibration routine being applied to the designated AOCS channel of FIG. 4, would provide the X and Y co-ordinate data for the AOCS system at the X and Y outputs of the processor 12. During this period, the accuracy of the spacecraft altitude will be dependent upon the stability of the amplitude (13) and phase (14) control elements which form part of the antenna array feed paths for the designated channel.

In order to cater for extended AOCS mode, some of the control elements of the designated AOCS beam would be temperature controlled. The number of such elements would be limited to a sub-set of those required to solely place the AOCS spacecraft receive beam over the transmitter position on Earth.

With the arrangement of FIG. 4, the use of the correlation circuit 10B of the unit 10 will ensure that only the spread spectrum TT&C uplink is monitored by the detector because any interfering signal will be reduced to insignificant levels by the narrow bandwidth of the detector.

Whilst the calibration procedures outlined above effect compensation for both amplitudes and phase drift in the antenna feed path, it may, with some systems, only be necessary to compensate for phase drift.

The primary objective of periodic calibration is to compensate temperature and life drifts of the active and passive elements in each beam forming path. As stated above, the achievement of the required stability for the paths on existing spacecraft gives rise to a temperature control requirement of .+-.2.degree. C.

Assuming that there will be a continuing requirement for similar phase and amplitude stabilities and using a maximum rate of change of temperature for payload equipments of 2.degree. C./Min, it is considered that a minimum calibration cycle time of one minute will be required.

It should be noted that 2.degree. C./Min is the normal design restraint applied to a thermal subsystem for an eclipse/sunlight change and therefore represents a worst case condition.

For a 12 channel beam former feeding a 200 element antenna array, each Complete calibration cycle represents less than 200 KBits of data, or a data processing rate of 3.3 KBits/sec for the array processor.

The transmit beam former calibration requires less than 20 KBits of signal level data per cycle. This leads to a maximum uplink data rate of 333 bits per sec on the secure command link.

For most of the operational life of the system, rates of change of temperature will be very much lower than the maximum, and hence calibration cycle times can be significantly extended. The calibration procedure could also make use of variable cycle time dependent on measured drift rates or orbital timing.

The New Science

by

Wilbert B. SMITH

(1910-1962)

Copyright 1964 by Murl Smith
Published by Fenn-Graphic Publishing Co., Ltd (Canada)
Assembled by W. B. Smith from data obtained from beings more advanced than we are.

Section One: The New Science

Foreword
Introduction
Chapter I ~ The Basic Concept
Chapter II ~ The Quadrature Concept
Chapter III ~ The Space Fabric
Chapter IV ~ The Field Fabric
Chapter V ~ The Control Fabric
Chapter VI ~ The Percipitation Fabric
Chapter VII ~ The Basic Particle
Chapter VIII ~ Radiated Energy
Chapter IX ~ Building Blocks of Matter
Chapter X ~ Forces
Chapter XI ~ Gravity
Definition of Unusual Terms

Section Two: The Q Concept

Section Three: Principles & Technology of Other Races

Part 1: Fundamentals
1.1 ~ The Structure of Meaning
1.2 ~ The Rectilinear Concept
1.3 ~ Relativity of Measurement
1.4 ~ Basic Reality
1.5 ~ The Concept of Spin
Part 2: The Structure of Spin
2.1 ~ The Spin Mechanism
2.2 ~ The Units
2.3 ~ Distribution of Spin
2.4 ~ Spin Velocity
2.5 ~ The Tempic Field
Part 3: The Spin Fields
3.1 ~ The Significance of the Tempic Field
3.2 ~ Simultaneity
3.3 ~ The Divergence of Spin
3.4 ~ The Curl of Spin
3.5 ~ The Gradient of Spin
Part 4: Multiplicity of Spin Centers
4.1 ~ General Considerations
4.2 ~ Summation of Scalar Spin
4.3 ~ Summation of Gradient of Spin

Section One

The New Science

Foreword

A first reading of this book will undoubtedly leave the reader with many questions in mind, and with few answers immediately obtainable. As a work which purports to provide a comprehensive yet simplified understanding of the universe and of reality as we observe it, it will appear most novel in its development, intricate in its ramifications, and will challenge the most vivid imagination. Yet, the implications are far-reaching in their significance and the applications innumerable. The serious reader is advised to peruse it often, and most of, to THINK.

THE NEW SCIENCE attempts to provide a fundamental understanding of reality in general, and of our known universe in particular. It advances a unified concept governing our awareness of reality, explains the generation of this reality, and describes the factors which mold it into the numerous forms in which we find it. To some extent it is not a "first" attempt. For centuries philosophers and scientists have, with varying degrees of success, framed hypotheses with the same considered objective. It may be said that such attempts at a unified understanding of the universe is a natural result of man's inquisitiveness and his searching need of the ultimate order. THE NEW SCIENCE is unique, however, in bringing into play not only those factors which are usually considered as physical and material, but also the more subtle yet no less important influence of the mental and spiritual.

The work was produced after many years of thought and investigation. Existing concepts were considered in all their scope and depth. It is the belief of many that numerous "clues" were obtained from civilizations much more advanced than ours. Some of the more physical aspects were confirmed by actual experiment and the less tangible considerations tested against observable data and evaluated for consistency. At this point, a few words about the author would seem appropriate.

Wibert Brockhouse Smith was born at Lethbridge, in the Province of Alberta, Canada on the 17th of February, 1910. He exhibited early in life an eager interest in the nature of things. At the age of 15, he wrote a treatise dealing with the controversial concept of perpetual motion. He was also the author of several scientific novels. After having obtained his S. SC. And M. Sc. Degrees in Electrical Engineering from the University of Columbia in 1933 and 1934, he spent four years on the staff of radio station CJOR in Vancouver, BC, where he became chief engineer. In 1939 he joined the Department of Transport of Canada, where he continued his work in the field of broadcasting and ...

[missing text]

Introduction

We find ourselves in this Universe, and we are aware of it. We strive to understand it, and to do so we use all means at our disposal. We observe and speculate; we look and sometimes we find; we ask many questions and get many answers. If the questions are proper we get proper answers, but if they are not proper questions we get indefinite answers or no answers at all.

Sometimes we cannot distinguish between cause and effect or the phenomenon and the effect of the phenomenon. Sometimes we mistake the shadow for the substance and pass by the reality while we pursue the image.

Often we are so enamoured of our own brilliance that we cannot see the little glints of Truth that line our way. Many shining nuggets of Truth lie buried at our feet and if we are not too proud to dig we will find them.

There are certain fundamental Truths in this Universe and if we are prepared to accept them we can use them as tools for its better Understanding.

No principal can be described or satisfactorily defined except in terms of concepts which are more basic, until one basic concept is reached which in itself cannot be defined at all, but which will define all other concepts.

The Universe contains no anomalies, and the appearance of an anomaly is warning that our understanding is inadequate.

Mathematics must be the servant of Understanding and not its master. Equations, by their very nature, cannot discover; they can only yield relationships derived from the initial statements and which were inherently in them when they were stated.

Truth is not hidden; it is available to all and is the same for all. Apparent differences must be due to inadequate understanding.

Chapter I

The Basic Concept

Whatever might be the origin of this Universe, of one thing we can be reasonable sure, that it is within "nothing at all". If it "started", then it must have started from nothing at all. It always was, this it has nothing at all around it. Whatever there might be beyond this "nothing at all" we have no way of knowing for we are within it and of this Universe and have no concept beyond it.

This idea of nothing at all is a most difficult one to come to grips with, but it is an absolute necessity to an understanding of even the first ideas of cosmology. Nothing at all means exactly what it says: NOTHING AT ALL; no space, no time, no substance, no energy, no change. To approach it one must slough off all reality and proceed deliberately into the void of nothingness. It is something extremely personal which must be experienced by the individual as a basic exercise; it is something which cannot be "taught". Most people recoil from the idea of nothing at all, feeling that it is akin to annihilation, which it is, but we must know of "nothing at all" before we can understand the basic concept upon which our Universe is built. Subsequent lessons are futile without this basic understanding.

Having become aware of nothing at all, there is only awareness and nothing at all, and Awareness injects into nothing at all a concept which will render it unique. Since no concept of any kind can be defined except in terms of that which is more basic, this Concept cannot be defined, and we may use it only in defining concepts which are less basic. Since this Concept is the basis of our Universe, its derivatives must be the basic parameters of it, and in itself it must remain the nameless Reality.

We do not know if this basic Reality exists independently from Awareness or whether one is the consequence of the other; or whether in the final analysis they are in fact one and the same. In any case we do know, or think that we know, that Reality does exist and we are aware of it. But we do not know how far beyond us the Awareness extends, and we must either postpone this determination pending a better understanding or accept the statements by other entities who are presumably more advanced than we are that Awareness is universal and extends throughout all Reality and has a particular relationship thereto which will be discussed later.

Our physical senses are very limited and we can observe directly only certain aspects of our Universe, and these only within strictly limited ranges. However, as our understanding increases we are able to devise ways and means for extending our sense both in range and scope, which in turn leads to better understanding. But we must always remember in thus extending our senses to distinguish between the language of observation and its translation into the language of our senses, lest we miss the phenomenon while inspecting its effect. Also, since the information we get through extensions of our senses is essentially "second hand", we must be doubly sure that it is truly what we think it is, that it is in fact "the truth, the whole truth, and nothing but the truth."

There are two ways of "learning", memorizing and understanding. No matter how good memory is it can never do more than regurgitate that which has been assimilated, without form and undigested. A library is an excellent memory but its understanding is nil. Understanding however allows one to KNOW and is not limited to material which has already been assimilated. Further, understanding can extrapolate while memory cannot even interpolate. Therefore, in dealing with the Basic Concept of the Universe which is Nothing-At-All, mere memory is not good enough; understanding must be used, otherwise the whole exercise is meaningless and we cannot KNOW.

In striving to attain the knowledge of Nothing-At-All and the basic concept of Reality within it, words are hopelessly inadequate because by their very nature words are merely symbols in which there is some degree of common understanding. As yet we have no words for that which is basic, and we must attain the understanding of it and then carry this understanding into whatever language we find convenient. But however we may approach the subject, the understanding of it is entirely personal. As one of the people from "elsewhere" once stated, "I cannot teach you; I can only help you to learn!"

Chapter II

The Quadrature Concept

Having understood Nothing-At-All and the basic concept of Reality within it, we must next understand the relationship of Awareness to these concepts. Whether or not Awareness and Reality are the one and same is probably the Creator's secret, but to us at least they seem to be separate and through the one we observe the other.

Realizing that at this stage we have not yet even approached the basic or derived parameters of the Universe, we have no understood framework within which t explore the relationship of Awareness to Reality. Also, since the only basic concept we have at this stage is the nameless one injected into Nothing-At-All, it is only this which we can use to define the higher concepts. Therefore, the only possible understanding of the relationship of Awareness to reality must be determined from that which is inherent within the understanding of both.

We could define the Quadrature Concept as the relationship of Awareness to Reality, and to some a definition of this nature may be adequate, but it would carry little or no understanding, and great difficulties would arise later when this concept is needed to understand the derivation and relationships between the twelve fundamental parameters. Therefore, a little time and effort spent at this stage to understand this relationship will pay large dividends later. Through the symbology of words and through analogy an attempt will be made to bracket this concept and bring it into approximate focus, and after that only individual and personal effort will bring it into precise focus and understanding will be attained.

Our personal; experience with awareness is largely confined to the operation of our senses. If we see something, and can see all sides of it, we usually have a pretty good idea of what it looks

like. Also, if we can feel it all over we can conclude quite a bit about its shape, temperature, texture, etc. We get more information from any sounds which it may make, or any smells which it may exude. Maybe we may even want to taste it. If we can get at it sufficiently to use most or all of our senses on it we can form a pretty good idea of what it is, and if we met it again we would probably recognize it. What then is the mechanism by which our awareness obtains this information?

If we find ourselves in a certain situation, such as being caught out in a storm, our senses respond to certain stimuli and we arrive at certain conclusions. Thereafter we have a degree of understanding of that particular situation, and would have no trouble recognizing or identifying it if we ever met it again.

Emotional responses, stemming sometimes from very restricted stimulation, can be distinguished and identified, and to a certain degree passed along to others if they are coded through their own experience to receive such information. Under these circumstances we can say that such emotions are "understood", but just what is the relationship of Awareness to them?

When we get into the area of abstracts such as mathematics, physical relationships and the like, logic and intuition extend the range and scope of our senses, but there still exists that mysterious relationship between Awareness and Reality.

In the transcendental area involving extra sensory perception, estannation, and those other capabilities of the mind which as yet are only vaguely appreciated, we also find a definite and determinable relationship between Awareness and Reality. In fact, anything about which we can think, if it in any way involves an aspect of the universe, must implicate and make use of this relationship. In the ultimate the Quadrature Concept is the link by which Awareness observes and Understands Reality.

Mathematics is a discipline in which many people have a fair understanding, and within which one facet of the Quadrature Concept manifest most elegantly. Geometry, complex algebra, and vectors all make use of a special relationship in which one line is at right angles to another. Various properties, some of which are obvious and some which are not so obvious, have been ascribed to this quadrature relationship between lines. In fact, whole mathematical philosophies have been developed around this relationship, and their practical application has given us electrical current, radio, aeronautics, and many others. In mathematics the Quadrature Concept manifests as two lines mutually at right angles, or to a line which has been subjected to an operation by the square root of minus one from its previous position. Successive operations yield relationships which are the cornerstones of various branches of mathematics. But the universal Quadrature Concept extends much beyond its mere mathematical application, interesting though this may be, and is in fact the Concept which links Awareness with the Concept which is fundamental.

Chapter III

The Space Fabric

Our Universe appears to us as an enormous, tremendously complicated system, with myriads of actions and reactions, functions and functional derivatives, and it is hard to realize that it is all a manifestation of a single basic concept in Nothing-At-All. We suspect, correctly, that there must be many "layers" or "levels" between the basic concept and what we observe around us. It is up these levels that we must work our way to an understanding of the universe, rather than downwards.

Anyone who is at all familiar with modern physics is, no doubt, appalled at its complexity, confused by the many correction and perturbation factors, and amazed at the many weird theories propounded in all sincerity to explain observations in terms of "established principles". Anomalies are the rule rather than the exception, and the amount of data which just won't fit is colossal. All in all it is fairly obvious that this view of the Universe is bogging down and we are in reality conjuring up a mathematical monstrosity and raising it to Deity status. It is truly the modern Golden Calf.

It is much more difficult to conceive of a universe which is basically highly complex but possible of breaking down into simpler units than to conceive of a Universe in which everything is built up of different aspects and combinations of these aspects of a single basic Reality. Therefore, why not tread again the path which was trodden by the Creator when the universe was established, and start as he did with Nothing-At-All and place therein the single basic Concept of Reality and study that which may be derived from it.

We were unable to establish the point of whether or not there is any interdependence between Reality and Awareness, and we may never be able to do so, but we must take it that they both do in fact exist, otherwise the whole exercise becomes meaningless and all is illusion. Therefore, insofar as we are concerned, the Reality of the Universe exists as we are aware of it.

The first degree of awareness of the basic concept is length. This is a bald statement and although many other combinations of words could be sued the MEANING is identical. Again, the understanding of this parameter is a personal matter and the mere reiteration of a formula will never convey understanding. Hence another personal visit into Nothing-At-All and a first hand view of the basic concept is called for. The viewing should be by means of the Quadrature Concept and, if correctly carried out to the exclusion of all else, that which is viewed will be the concept of length. This is the First Parameter, or as it might fairly be put at this point, the First Dimension. [Planck's Constant, *L]

Now, if the Quadrature Concept is again applied to the basic Concept of Reality, taking into account the already established Parameter of Length, and Area will be established, which is the Second Parameter. This Area is the true Second Dimension, thus making Volume the true Third Dimension, and for similar reasons another Length at right angles to the other two could not qualify.

Hence, Awareness of the basic concept of Reality, through successive applications of the Quadrature Concept has established a fabric of three Parameters, Length, Area and Volume, containing One, Two, and Three conventional Dimensions. This is the Space Fabric, and establishes a place for the Universe, which is at once simple and possible of understanding. There is no need for Warps, Foreshortenings, and all the other attachments appended to Space by conventional science to avoid facing the Universe as the Creator faced it, from the viewpoint of Nothing-At-All.

At this point it may be well to say something about Zero and Infinity. Originally these were mathematical concepts which gradually became established in our consciousness even though to most people they never had any real meanings. Mathematically it is possible to evolve quite satisfactory definitions for Zero and infinity, and so long as they are confined to mathematics we can get along with them quite well. But when we try to become aware of zero or infinity as a personal experience, we find it most difficult. It is only through the Quadrature Concept that we can become aware of these two extremes at all, but if we do view them "in quadrature" we find them quite understandable; in fact, they become, they become as real as any other numbers.

We can say that Zero is the smallest number in which our Awareness has any interest, and that Infinity is the largest number in which our Awareness has any interest. If we have the same degree of interest in Zero as we have in Infinity we will find that Unity is exactly half way between. This is quite apart from any scale of measurement and is a most important relationship. It is because *nothing in the universe is absolute except the basic concept of reality itself*. Even geometrical relationships are tempered by the means by which we become aware of them.

In establishing the Space Fabric we have understood only the concepts which result from the application of the Quadrature Concept to the basic Concept of Reality. While we immediately recognize the results of these operations as the space within which we dwell we must avoid implying other properties to it than can be derived directly from the basic premises. In other words, we have only space, with nothing in it. Anything which we may subsequently define within Space must be derived by further applications of the Quadrature Concept if it is to have any meaning.

A further word may be said about scales of measurement. Within the space just described there are no scales of measurement, and any positioning of awareness must of necessity be entirely arbitrary with one position being quite as good as any other. Relative positioning must of course remain relative regardless of how many positions may be established. A corollary of this is that Space is linear no matte where we investigate it, and this relationship must be accepted as fundamental.

Chapter IV

The Field Fabric

In establishing the Space Fabric the basic Concept of Reality was operated upon successively by the Quadrature Concept, giving the concepts of Length, Area and Volume. Further operations with the Quadrature Concept will yield more relationships which, when established may be recognized as parameters of the Universe in which Awareness finds itself.

Since the relationships established to constitute the Field Fabric do not impinge upon our awareness as directly as does Space except in their composite forms, some sort of language is needed to facilitate Understanding. To those having a mathematical background this presents no particular problem since the relationships are merely those of established Vector Algebra. To those not having such a background, understanding must be obtained through appreciation of the meanings of the actual words used. In any case, if the basic principles already set forth have been adequately understood, there should not be too great difficulty. A visualization of what is going on, extending upwards from Nothing-At-All, as the Quadrature Concept is applied successively to Reality and its derivatives, is really what is called for.

The application of the Quadrature Concept to the Third Parameter yields a further parameter which we might describe as Density or gradient, and is really an expression of how Reality is distributed in Space. Vectorially it is the scalar view by awareness of the Volumetric parameter of Reality. It is the scale against which any change in Reality must be gauged. The Fourth Parameter is therefore essentially Change, the true Fourth Dimension. There are many interesting implications which will be studied later in more detail.

If the Quadrature Concept is applied again, another partially familiar vectorial quantity results, namely Divergence, or the stable condition in which Awareness finds Reality. This is the Fifth Parameter, which also presents some interesting implications which will studied later.

The Sixth Parameter is developed by still another application of the Quadrature Concept to Reality, which gives the vectorial quantity Curl, or Deviation or Reality, which is essentially the dynamic aspect of Reality as perceived by Awareness.

At this point it is fairly obvious that our Universe is poly-dimensional in the truest sense of the word, even though the dimensions are not quite what we fancied they ought to be. They are more correctly parameters and are aspects of Reality established by Awareness through the mechanism of the Quadrature Concept. Again, we cannot say whether or not Reality could exist without Awareness, but we believe that they are actually separate manifestations of the same thing, and one is incomplete without the other. In any case, so long as we are aware of our Universe it must be through the Parameters which are inherent in it. And there are six more of them making twelve Parameters in all, after which the system closes on itself. These Twelve Parameters are the necessary and sufficient conditions for the existence of the Universe as we are aware of it.

Although there is a smooth relationship following in the development of the various parameters we find that they fall naturally into four fabrics of three parameters each. Just as each parameter has its unique characteristic so each fabric has its own unique characteristics, which include those of the individual parameters and the interrelationships between them.

It should be noted that in the development of the three parameters in the field fabric the Quadrature Concept was applied in each case to the previously established parameter, and in its broader sense. This should not be confused with the mathematical manipulation of multiplying the previously established parameter by the square root of minus one, as this is an operation which will subsequently be employed and is similar to parallel processes which go on in the space fabric. While this distinction is fairly obvious in the space fabric it may not be so obvious in the field fabric.

Let us next look at those aspects of the Universe which impinge upon our awareness and which may possibly be identified with the parameters of the field fabric. The Fourth Parameter, Change, reaches our awareness through our concept of Time, although we have here mistaken the shadow for the substance and vice versa.

A field is a region which has a unique characteristic. The space fabric, in displaying the characteristic of Change, has a unique characteristic, so that this characteristic which so appears can qualify as a field. But the filed must be "somewhere" and the space fabric fills this need, just as Area is necessary for the evolution of the concept of Volume.

Suppose we call this field of Change a Tempic Field to give it a name of its own, so that we can study its relationship to those things which impinge upon our awareness. Inspection of the Concept shows that if the Change is great the tempic field must be great, but we associate Change with our Concept of Time which is something against which we gauge a rate of change. Expressed mathematically this rate can be written as dS/dt which expresses the manner in which something changes with respect to time. More explicitly this should be written as TS where T is the tempic field operator, and S is the aspect of Reality upon which it operates. A convenient, though only partially adequate description of the Tempic Field is "Frequency", since we recognize frequency as being a certain number of somethings per unit of time, and is dimensionally the reciprocal of Time.

Heretofore we have always considered Time as an immutable flow against which everything evolving Change could be measured, whereas, it is really the converse which is true; Change is the basic concept and Time its derivative. Unfortunately, our mathematics are geared to the Time concept and will require considerable reworking to fit them into this more precise concept, but when this is done there will result a most elegant simplification in all the analysis involving time.

In the meantime the transition in thinking can be made less painful if we merely regard Time as the consequence of the existence of a Tempic Field, and is by no means fixed.

It may be interesting at this point to mention something about the velocity of light. This quantity is generally recognized to be something rather basic in our universe, being the "rate at which space changes with time", but when viewed in the light of this new field concept is merely the tempic field intensity, or how the tempic field is distributed in space. We have been told that light doesn't "travel"; it "is", which is an idea not at all foreign to the field concept. Of course, it follows that the velocity of light will be a constant only under conditions of constant tempic field, and if this field changes so will the velocity of light change.

Having had a superficial look at the Tempic Field and its derivation we may now allow our Awareness to inspect the next parameter which is Divergence to see if it is something which can be recognized. Previously we noted that Reality had to extend to infinity from zero in order to establish Space and that unity, so far as Awareness was concerned, lay half way between. With the application of the Quadrature Concept to the parameter of Change or Tempic Field, Divergence is established, from which we derive a starting point a t zero and a finish at infinity. Between these two limits and through unity there is divergence, which we can recognize as the Electric Field, but with the exception that there is no point charge at the zero. Our Awareness, however, established the "charge" at radius unity, with exactly one half of it being "inside" and the other half being "outside". The real significance of this boundary will be apparent when we study the tenth parameter.

When Divergence was established by Awareness, the Quadrature Concept was applied to the Tempic Field, so we may expect within the electric field two quantities, scalar and vector, or quantity and its manner of distribution. These attributes we recognize immediately as pertaining to the electric fields with which we have experience.

While the Tempic field is purely scalar, the application of the Quadrature Concept gave it an aspect which is vectorial in establishing the Electric Field, in that it now has "direction" as well as "quantity". In dealing with this parameter both these aspects should always be included. Otherwise the analysis is bound to be incomplete. In other words, mere vectorial summation is not sufficient and the scalar values must be integrated also. Also, we must get away from the idea that they are the manifestation of the fifth parameter from zero to infinity and in themselves are the reality.

When Awareness inspects Divergence through the Quadrature Concept and establishes Curl. Similar appreciation results, and we see in Curl many of the characteristics of the Magnetic Field, but again we have a boundary within which is half the reality and outside of which is the other half. We call that within (or without) this boundary the magnetic moment, but again we cannot establish a point source. Also, dealing with magnetic fields we must always include the scalar as well as the vectorial aspects.

Just as Area has Length incorporated in it, and Volume has Area incorporated in it, so has the Electric Field the Tempic Field incorporated in it. Each of these three fields are mutually at right angles to each other. The three fields together are the manifestation of Reality in the Field Fabric as perceived by Awareness. The interrelationships between these various fields manifests to our Awareness as Matter and Energy, and the great variety of these manifestations is well known to us.

Chapter V

The Control Fabric

The complete understanding of the Control Fabric is not easy, chiefly because by their very nature, our mathematics cannot be applied to it directly, and any analysis must be indirect. However, it is hoped that with some understanding of the Fabric suitable mathematics will be evolved with which to deal with it. In any case it should be realized the Understanding comes with increasing Awareness and if the basic concepts are understood, the rest will follow.

Awareness, inspecting Reality, notices that the Tempic Field is to some extent everywhere, and except for any arbitrarily prescribed reference point is largely homogenous. The Electric Field, however, does have a reference point of its own but other than this it spreads out everywhere. The magnetic Field, in addition to having both the foregoing characteristics, has another one, namely orientation.

If the Quadrature Concept is applied to the Magnetic Field it will be found that its orientation can be anything, or in other words, it is Random. The probability of finding it in any particular orientation is exactly the same as for any other orientation, and while the Field itself has a unique characteristic, its display is strictly random. While this is a rather over-simplified derivation of the Seventh Parameter, it may be sufficient to guide thinking in the direction of its appreciation, and as has been said previously, this appreciation is purely personal.

In all previous applications of the Quadrature Concept by Awareness, the matter of choice did not arise as how the Concept was applied did not make any difference. However, with the application of the Quadrature Concept to the magnetic Field, this is no longer the case, and a condition of asymmetry has been introduced which makes it necessary to decide how the Concept shall be applied. In fact, the application of the Concept is in itself a definition of the Eighth parameter, which is that of Decision, or Free Will.

The Ninth parameter, however, again establishes symmetry, and leads to a concept of Sequence, or Order, or Specific Arrangement.

Up to the Eighth Parameter, Awareness was largely in the position of Observer, and was unable to make any difference in the scheme of things in the Understanding of what happened when the Quadrature Concept was successively applied to the Basic Concept. Concept was successively applied the basic Concept. However, with the Eighth Parameter, Awareness became part of the Scheme in that a difference could result. It is at this level that Free Will is exercised, even though we may have many ideas to the contrary, and it is through this characteristic that we are able to control at least a part of this universe. Increased understanding will of course make possible extension of control, to the extent that our Awareness actually does Understand.

There is a price tag on this control through Free Will, however, in that the next application of the Quadrature Concept establishes a pattern which persists right around the cycle, and sequences are established which are directly consequential of the application of the Eighth Parameter.

In our relationship with the Universe we see all sorts of applications of the Control Fabric, from Random, through Free Will and into Sequence, as well as all sorts of combinations of them. Again, as was the case in the lower fabrics, each Parameter includes the lower Parameters as well as extending the Concept to include a new one. Therefore, it follows that all higher Parameters than the Eighth will be subject to modification by Awareness, with proper Understanding. The modification will be the consequence of the operation on the asymmetry of the Field Fabric, and its consequences will be felt right up to the Twelfth Parameter.

Chapter VI

The Percipitation Fabric

Once Awareness has understood through the application of the Quadrature Concept, the establishment of the first nine Parameters, the further application of this Concept yields three more Parameters which bring Matter and Energy as we know them into being. Again, as in the Third or Control Fabric, we have no tools except our own Awareness and understanding to follow through the evolvement of this Fabric. The two higher Fabrics require much more sophisticated manipulations than our mathematics are capable of to show the relationships existing between the lower Parameters and Fabrics and the higher ones, and at our stage of evolvement we can reach them only through personal mental activity aided by hints and direction from others who have already passed this way.

The application of the Quadrature Concept to the Parameter of Sequence yields the Tenth Parameter, Form. It was previously mentioned that there is a unique value between zero and infinity called Unity where exactly half the Reality is "inside" and half is "outside" While it is true for formal mathematics and may be so established, it is also universally true outside of this discipline, that no amount of manipulation can alter the value of unity and it always remains the fulcrum about which all other values pivot, regardless of scale. The Tenth Parameter attaches a special significance to this value in that it becomes the apparent boundary of Reality.

It is at once apparent that there is no prescription of any "absolute" quantity of Reality, or any scale of dimensions at all in this derivation. Therefore it follows that any and all Reality will manifest Form such that its apparent boundary will manifest half of the Reality inside and half outside. We do not know, and may never know, the total amount of Reality in the Universe, but the Form of the Universe will be such that half the Reality is inside and half outside. At the other extreme, the smallest bit of Reality that we can discern will also have this characteristic of one half being inside and the other half outside.

The next application of the Quadrature Concept yields the Parameter of Multiplicity, where more than one Form is established. Remembering that each Parameter contains within itself all lower Parameters, any and all deviations will reflect in the higher parameters and the Eleventh Parameter will allow individualization in Form as a consequence. This may not be at once obvious, but it is the mechanism by which the various bits and pieces of matter and energy came into being, actually a coagulation of substance out of the basic Reality.

When the Quadrature Concept is again applied there results the Parameter of Aggregation, or Assembly of bits into a Purposeful Structure. In this region resides the recognizable universe, animate and inanimate. It is the degree of exercise of Free Will that distinguishes between these two realms.

Further application of the Quadrature Concept merely offsets the universe from itself, which is the same as another linear dimension or First Parameter and the system closes on itself. Therefore, within the Universe as we are aware of it there are only these Twelve Parameters. They are the necessary and sufficient conditions for our Universe as we know it, and all of which we are aware can be defined in terms of these Parameters, and it is the duty and responsibility of Science to do so.

Having established twelve Parameters through our Awareness observing the Basic Reality through the Quadrature Concept, the question naturally arises regarding the place of Awareness in the Universe. Since none of the Parameters in any way establishes Awareness, yet Awareness

observes all twelve, it must occupy some unique position relative thereto. This is true, but its understanding is not aided by the Reality of the universe and again it becomes a personal matter.

The following analogy may assist in visualizing to some extent the relative structure of the universal parameters and Awareness. Consider a sphere which is completely surrounded by twelve other spheres of the same size. All the spheres are in contact, and all the outer spheres are in contact with the inner. Only three spheres and the inner sphere can have mutual contact under any one circumstance. Radius of these three spheres may be mutually at right angles and the radius of the inner sphere may be in line with any one of these. Depending on the starting point and progression, all spheres may be inspected sequentially, without any preference. A quadrature relationship is possible between any three spheres, including the central one. All these relationships are valid with respect to the relationships existing among the twelve parameters and Awareness.

Chapter VII

The Basic Particle

Establishing the Twelve Parameters of the Universe, in their four Fabrics of Three Parameters each, makes it possible to study from the point of view of the Creator the evolution of the basic building blocks out of which our Universe is constructed. Considering the evolution of one particle only we need go no higher than the first seven parameters, actually holding the seventh constant. The higher Parameters enter the scene only when we want to do something with the particle so established.

The first three Parameters set up a framework in space within which the particle will appear, and the next three will provide the wherewithal with which to make it. We can work with Length, Area and Volume, Tempic, Electric and Magnetic Fields, and all needed relationships between them. Our result will of course not be a true particle, because the higher Parameters will not have been applied; for example, it will not display Form, but will be diffuse from zero to infinity.

In the establishment of the Space Fabric the repeated application of the Quadrature Concept stepped up the available dimensions to three but it also made possible all sorts of quadrature relationships within this framework. Similarly, in the establishment of the Field Fabric three field regions were established with quadrature relationships between them. Furthermore, there exists complete quadrature freedom between the field and space fabric, so that in effect we work in a Six Dimensional Continuum. It is easy to appreciate the large number of possibilities among the many permutations and combinations of spatial dimensions and fields, but the real problem is to sort out the actuality from the possibility. This can be done only by continual cross-reference to observation of Reality; i.e., by asking Mother Nature the right questions. We can be reasonably certain, however, of one thing: there will not be any unused Parameters, and the final result of the studies will involve all six.

Since we have no senses by which we can become directly aware of the various fields we will have to depend on the second hand data made available through our instruments, and here we must be extremely careful to distinguish between the phenomenon itself and the effects of the phenomenon on the instruments. Also, we must be particularly careful in posing our questions to nature that they ask exactly what we want to find out and are not ambiguous.

In developing the twelve Parameters, the Quadrature Concept was applied between Awareness and the next lower Parameter, but it may also be applied between any aspects of any Parameters, or any derivatives of them. In doing this, however, it is most necessary to realize just what is

being done, and to understand the relationships which are involved. Furthermore, we must never forget that we are dealing with Reality, and even though certain aspects may become zero, the Reality never vanishes. Conversely, any aspect which extends to infinity is still reality.

Since it was established that reality does extend in all cases from zero to infinity, it follows that if there is to be particularization as made possible by the eleventh Parameter there must be "overlap" among certain aspects. This simply means that in the field fabric it is possible to have fields that exist independently amongst themselves and independently of any "background" which may also exist. In fact, we do not know directly at present how much "unpercipitated Reality" there is in the universe, which will of course appear as a uniform background to the precipitated Reality with which we exist.

Whether or not fields stick together and add up to a single field depends entirely on the antecedents of the field. If the fields are of unit particles they will become coherent for more than half of the reality to be held in common, when the little bits combine to form a big bit. If a field is produced by the simultaneous behavior of lots of particles or other fields, then it will be coherent, so long as more than half its reality exists in common. These are basic principles and form the subject matter of a series of interesting and enlightening experiments, and when understood provides an elegant interpretation of much data being pondered by students of these matters.

The transition between coherent and incoherent fields results from conditions which bring more or less than half of the reality in common, and the 'stability" is purely a function of how close to "half" the system actually is.

In manipulating fields and applying the Quadrature Concept between them, we must understand that what we are really doing is allowing one field to operate on another. The operation of A on b is not necessarily the same as the operation of B on A, although there can be relationships between these two operations. Successive operations will go right around the circle and back to the starting point provided certain conditions are met. These conditions will become apparent later.

There is basically no difference between particles and radiated energy, except one of structure and configuration. Both contain Reality and are made up of fields in space, and are subject to the higher Parameters. We can say that radiated energy is "extended" and that matter is "reentrant", to describe loosely their configurations and structures.

With the foregoing in mind we can now explore what happens when the various fields are operated upon by each other. When an electric field is operated upon by a tempic field, i.e., changed, a magnetic field results. When a magnetic field is operated upon by a tempic field, i.e., changed, an electric field results. A tempic field should result when an electric field operates on a magnetic field, but the trick is to make it do so. Also, we would like to know what happens when a tempic field is operated upon by an electric field or a magnetic field.

A tempic field is largely amorphous and has direction only in relation to its own gradient in space, while both the electric and magnetic fields have vectorial aspects in addition to their scalar aspects. Therefore, we could hardly expect complete symmetry among the operations of these three fields. We can, however, work through an intermediate arrangement whereby we generate the desired field with its interaction already built into it. Whether or not there is a limit to this sort of operation we do not know, but it certainly hasn't been found yet, and it is a valid approach so long as we keep the basic rules constantly in mind.

As an introductory exercise consider the operation of a tempic field on an electric field by the simple expedient of having the electric field move. A magnetic field will be produced and will have a certain specific orientation. The vectorial direction of the magnetic field will be mutually at right angles to the direction of the electric field and its motion. Now, since the magnetic field is a curl function its divergence over the entire field must be zero. In order to bring this about the magnetic field must operate on either or both if the other fields to close the system somehow, somewhere. One such method would be for this operation to increase the tempic field on one side and decrease it on the other so that the motion would close into a loop, which implies the operation of the magnetic field on the electric field to produce a tempic field. If the structure of the three fields is understood, the validity of this operation is at once apparent, which establishes another principle; namely, that when a magnetic field, produced by a moving electric field, is moved longitudinally a tempic field is produced.

More thinking about this exercise discloses the fact that if this system merely closes on itself, the divergence, which is the electric field is eliminated, so that the only way in which the system can be self-sustaining is for it to close toroidally, so that there will be components of all three fields in all directions. That this is in fact the model of the basic particle of the universe in which we exist is amply borne out by experiment, because it displays a tempic field, an electric field, and a magnetic moment. The electric polarity depends on whether the spiral is right- or left-handed.

Inspection of this model discloses the fact that the tempic field will drop off as the inverse distance from the center of the toroid, the electric field will drop off as the inverse square of this distance, and the magnetic field will drop of as the inverse cube. What fields we observe with our instrumentation in the vicinity of such a particle will be the summation of the particle fields, the fields of all other particles, and the unresolved background fields of the fabric itself.

Possibly a clearer understanding of the structure of the basic particle may be had by considering the composition, orientation, and interaction of the entire field structure, considered together as a unit.

Looking at the composite field structure shows us three fields at right angles to each other. There is the tempic with its gradient in one direction, the electric with its divergence in a direction at right angles to it and including it, and the magnetic at right angles to the other two and including both of them. For self-sustaining conditions, the operation f each upon the other, there must be one-for-one relationships between them. Therefore the real movement under stable self-sustaining conditions will be in the vectorial 1,1,1 direction, or exactly midway among the three directions of the component fields.

The skew progression of the fields results in a double closure of the system, which will have both rotation and precession. It is readily apparent that since the tempic field only must have a specified gradient, the other two fields have two possible orientations, which will result in two directions of possible rotation and two directions of possible precession. The electric polarity of the particle will be the resultant of the coherent fields arising from both the rotation and precession, and can have two values of positive and two values of negative. Because of the necessary geometrical conditions imposed by the nature of space itself, the precessional field will be smaller than the rotational field giving particles having two values of positive charge rather close together and two negative equally close together.

The significance of these differences in charges will be discussed later in the chapter on gravity, as well as some very interesting circumstances arising out of the skew condition, particularly at close range.

Chapter VIII

Radiated Energy

The basic tempic particle rsulted from the operation of the tempic field on the electric field through movement. In other words, there was a permitted gradient of tempic field in space. If, however, we had insisted that the change be such that it occurred at one place we would have had a slightly different picture. The only change possible under these conditions would have been an increase or decrease in the electric field through the operation of the tempic field, and it would have had to inject its own quadrature relationship in order to exist. Therefore, the tempic field must in itself carry the quadrature concept, which simply means that it becomes a sinusoidally varying alternating field in the single space location.

Now, if the tempic field varies at any point in space, adjacent to that point there must be tempic field gradients, or "velocities". Since the electric field has a definite orientation, and consequently the magnetic field resulting from the tempic field operation will also have a definite orientation, it will in turn produce a further tempic field of definite orientation which will be coherent with the original field, increasing it in one direction and reducing it in the other direction. The whole business can therefore become self-sustaining only if it darts off in this particular direction with the velocity of light, or in the direction of the establishing tempic field gradient.

It is readily apparent that we cannot avoid space getting into the picture in some way or other. If we permit things to travel through space, they just go round and round and stay in one place, but if we try to make them stay in one place they dart of with the velocity of light! Furthermore, the difference between matter and radiated energy is very similar to that between Direct Current and Alternating Current. Otherwise, there is very little difference between the two forms of the expression of Reality.

As coherence is possible among particles, if more than half the reality is common, so is coherence possible in radiated energy if more than half the reality is in common.

The extent to which the tempic field makes use of the quadrature concept in its operation will reflect in the "wave length" of the radiation, which in turn will reflect the quantity of reality involved. The maximum values of the electric and magnetic fields will be those existing in the region where the radiated energy originated, since there is no concept in this universe for Negative Reality, and the operations must be on the total coherent fields present. This same reasoning applies to the size and maximum fields of the basic particle.

It follows that where radiated energy originates in fabrics having appreciably different background fields, its wavelength will be different from that of equivalent radiated energy originating in more familiar fabric.

Within the universe which we perceive, we are reasonably satisfied that the maximum value of all the coherent fields involved in our particles and radiated energy have the same value. Planck's Constant is the numerical expression of this value, and the velocity of light is the expression of the numerical value of the tempic field intensity Whether or not other universes can and do exist having other numerical values, and what the relationships ought to be between them, is quite another matter, subject to entirely separate consideration.

In the previous consideration the operation of the tempic field on the electric field was proposed as the starting point. If, however, the initial operation was on the magnetic field, an additional complication gets injected. The electric field so generated can have its required divergence only if the whole systemis folded back on itself. This establishes a condition where the magnetic field

is entirely closed on itself about a tempic field "core", with the electric field interlaced with alternating polarity. Picturesquely, it would look like a string of magnetic doughnuts of alternating magnetic direction, stuck together with electrostatic icing of alternating polarity, and all threaded into a string of increased tempic field and placed inside a tube of decreased tempic field. A most complicated picture, but one which does exist in this universe and has some most remarkable properties. For lack of a better name it is called "tensor energy".

Tensor energy carries its tempic field with it, so it is therefore not subject to propagation, and both ends of the beam are actually simultaneous (interval zero). The beam does not dissipate and has the same numerical values at the receiving end as it has at the transmitting end. Regardless of the combination of field conditions encountered at the receiving end, the same relationships are maintained as existed at the transmitting end. Reversing the initial polarity of the magnetic field will place decreased tempic field on the inside and increased on the outside, so that several tensor beams can be stuck together as a "cable". Since the tensor beam does not have any external field of any kind it is immune to any and all outside field effects. The only manifestation external to the beam itself is the tempic field gradient of the outer sheath.

Chapter IX

Building Blocks of Matter

When the basic particle was developed it was tacitly stated that only the first six parameters would be considered. However, during the development there were many instances when the higher Parameters were invoked, particularly those of the Fourth Fabric, so that not only could the particle itself be visualized but some idea might evolve a to how it might be related to other particles. When all the parameters have been applied there exists a particle, having form, along with many others of its kind, and having certain definite relationships to them, and possible of combination with others to form purposeful aggregates.

Two particles will merge into a single particle if they can be so arranged that more than half the reality is in common. Since the basic particle is shaped like a toroid, stacking them is rather obviously the way to achieve this. We can put them together alternately with opposite polarities until we reach a point where this basic condition no longer holds. Remembering that the tempic field is an inverse distance field, the electric is an inverse square field, and the magnetic is an inverse cube field, the coherence of the various fields will be different, and there will be reached limits beyond which the system will not be stable with simple stacking. We can then stick the stacks together sideways, and then stick another stack on the ends of the resulting assembly, and so on.

Electrons and positrons as we know them are basic particles, and protons and neutrons are simply stacks of these with either an even or odd number in the stack. Mesons are merely fragmented stacks. There are quite a variety of other bits and pieces made up of basic particles stuck together through their field coherence, with varying degrees of stability being displayed according to how close to the half-in-half-out rule they are.

Since it is rather obvious that no pattern of stacking can ever make all the fields involved equally interpenetrating, there must be some pattern of leftover fields manifesting outside the composite particle, and these are the fields which establish the characteristics of matter as we know it. Study of the relative configurations of the electric and magnetic fields establishes the electric charge and the configuration of the family of basic particles which the composite particle attracts. The electrons will drift into the electric field and then attach themselves over appropriate

poles, to an extent that interpenetration can be established between electron fields and the residual fields of the composite particle. The number of poles and the number of unit charges determine the "elements" as we identify these systems.

The tempic field, being purely scalar in nature merely contributes to the manner in which changes can occur in the system. If, however, through some characteristic of configuration, the tempic field within a composite particle displays some irregularity, this will manifest as a "vibration", and if the magnitude of the vibration is such as to cause the interpenetrating fields to exceed the half-and-half point the whole system will come apart: radioactivity.

When a system does come apart, those fields which were coherent and interpenetrating in the correct proportion will remain so and take off down the tempic field gradient and become radiated energy.

The fields which contribute to the internal "attractions" of atoms are the electric and magnetic, supplemented by secondary fields resulting from any further operations between the basic field parameters. These fields form a static pattern, which is dynamic only when tempic field irregularities occur. The difference in energy levels is the extent to which the fields are coherent in the proportions to form radiated energy, which can enter or leave the system upon appropriate arrangement of its components.

At this point it may be well to call attention to a simple but often overlooked principle. Since all Reality in this universe must conform to the parameter of Form, it must always display the characteristic of being half-in and half-out. This rule also applies to energy, either quantized or amorphous. Energy always exists in conjunction with its conjugate. In other words, in any reaction involving energy, we see only one half the energy involved; the other half is either inside or outside from our point of concern. It is most fortunate that this is so, otherwise the universe wouldn't work!

In developing our understanding of radiated energy we made certain initial assumptions, i.e., that we hid have a field upon which we could operate, and that this field was sufficiently detached that the operation was so isolated that it could be considered quite apart from any interaction with other fields or particles. Rather obviously this does not represent a real condition. In nature we always find a close association between matter and energy somewhere in the scheme of things, and usually at both ends of the syste, sowe should have a closer look at the interaction of matter and energy, always bearing in mind that they are both different aspects of the same Reality.

The reason that fields curl around to form material particles is because tempic fields are generated which increase the time available on one side of the system and decrease it on the other. Therefore, whenever any degree of asymmetry is introduced into a coherent field system, it will change direction and if the conditions are right for the system to be self-sustaining, a particle will be formed. Conversely, if a discontinuity is introduced, sufficient to disturb the closure of a system, the differences in the tempic field distribution will disappear and the particle will dart off as radiated energy.

When particles merge to such an extent that the interpenetration of the fields exceeds the halfway point, and an asymetry is introduced, a tempic field gradient is established away from the system in the direction bisecting the asymmetry, in both directions so that two bits of radiated energy take off down these gradients.

Conversely, when two approximately equal bits of radiated energy merge beyond the halfway point, a deviation in direction of the tempic field takes place which, if it can be maintained, allows the bits of radiated energy to merge into a particle.

Within a complex structure of particles there may be coherent field systems, which if disturbed may acquire a linear tempic field gradient, and a bit of the Reality will take off down this gradient and radiation will be emitted by the structure.

With the curling in on itself of radiated energy, if the geometry is correct, the alternating field aspects flow into a uni-directional arrangement, and conversely, when a particle unwraps to form radiation, a quadrature phase is introduced in the field relationships.

With an understanding of the basic particle, the structure of radiated energy, and the transition mechanism, we do in fact have the understanding of how this universe is put together and how it operates. Using the principles already understood we can explore all the many and varied manifestations of matter and energy, and understand just what goes on. Here and there we can confirm our understanding by reference to experiment, in the full knowledge that we will pose our questions correctly, and that nature will give us explicit answers.

Chapter X

Forces

In the evolution of the twelve Parameters of the Universe by the Quadrature Concept on the Basic Concept in Nothing-At-All, such questions as the forces involved and the energy which became apparent did not arise. These matters come into beings only when the twelve Parameters have been established, and we find that what goes on in this universe requires some understanding of these factors.

A field is a region which has a unique characteristic. The unique characteristics of fields were established by the operation of the Quadrature Concept on the Space Fabric and then in turn on the fields as each was established. In the earlier stages of this development, before the application of the parameters higher than the Sixth, we could not discern the presence of these factors in the amorphous background of the field and space fabrics; only the Reality which had been established.

Subsequent applications of the Quadrature Concept provided Control and Percipitation, but none of the Fabrics added anything beyond what existed in Nothing-At-All as perceived by Awareness, and all Reality which existed or can exist was provided by the Creator in that original state. Awareness merely established how it was arranged to establish the universe as we know it.

We generally think of a Force as something which pulls or pushes against some sort of resistance, and as such have a pretty fair, but superficial, idea of what it is. In the establishment of the Space Fabric, Force is what stretched a Point into a Line and kept it there, and what pulled a line out sideways to make an area and held it there, and what pushed the area apart into a volume and sustained it. Force provided the means by which the density of Reality in Space was adjusted to form the Tempic Field, and the means by which the Tempic Field was given a Divergence to establish the Electric Field and the means by which the Electric Field was given a Curl to establish the Magnetic Field, and the means by which these fields were sustained.

Force, in turn establishes the parameters of the Control Fabric and the Percipitation Fabric, and makes possible the establishment of Matter and Energy as we know them. In other words, each

operation with the Quadrature Concept involves a Force arrangement, and the magnitude and significance of each of the Forces depends on the manipulation carried out and the Fabric in which it is being done. Conversely, forces always develop whenever Reality is modified, and always in the Fabric where the modification takes place. It takes the combined manipulation of all three Parameters in any one Fabric to extend a force into another Fabric, which, needless to say, is a rather special arrangement.

We say that Energy is the ability to do work, or the ability to establish a force which will operate against a resistance over a certain prescribed distance, but these ideas are not quite basic enough to relate Force with the basic Reality. Looking at a region of unit size in which there is a field, we note that this field came into being because of the Quadrature Concept, a Force, and is being sustained by this Force. The Unique Characteristic which describes this field says that there is s difference between opposite sides of the unit region, in the direction of the field and therefore the field must be stressed against itself in this direction and therefore the Reality so expressed is the product of the field intensity with itself, and the total Reality within the total field will be the integrated value of this "Field Intensity Squared" over the entire space occupied by the field, bearing in mind the half-in-half-out relationship of Form. Or we can concern ourselves with the Reality or Energy within a limited region only and perform the integration over that region. There is a very interesting factor which enters the picture at this point called the Principle of Inversion.

If a region is selected in which there are two fields of the same kind, same magnitude and same direction, such that very nearly half the Reality of each is within the region, then the two fields are just on the edge of becoming coherent. If the fields are not coherent the total energy in the region is the sum of the energies of the two fields, i.e., twice the square of the field intensity of each integrated over the region. If, however, the fields are coherent, the total energy is the square of twice the field intensity integrated over the region, or twice the energy of the two fields incoherent! This relationship is most significant as it represents the "packing energy" of the bits and pieces in atomic nuclei, and also points the way to the precipitation of energy out of the cosmic background.

When we take a look at the mechanics of matter we find some interesting relationships. Kinetic energy, or energy of change, is one half the mass times the velocity squared. But the velocity is the reciprocal of the gradient of reality or the tempic field, from which it appears that the energy is one half the mass times the tempic field intensity squared, integrated over the region involved in the change. If the mass is taken as the density of reality times the volume it occupies the fact that twice as much energy appears indicates that the fields making up matter are coherent. This again is an important relationship as it pertains to the chopping up of matter.

Chapter XI

Gravity

The twelve Parameters of the Universe are the necessary and sufficient conditions for the establishment of our Universe as we know it, and together with the unique position of Awareness forms our entire experience in this physical world. All of which we are or can be aware are expressable in terms of these twelve Parameters.

Gravity is a phenomenon with which we have daily experience but which we haven't earned very much about, working backwards as we do from effect to cause. The fact that objects fall when given an opportunity to do so, experiencing an acceleration which appears to have very nearly

the same value on this planet for all falls, leads us to the conclusion that it is somehow an inertial phenomenon. The added fact that ordinary manipulations appear not to affect gravity leads to the conclusion that somehow gravity is inherent in matter itself. By studying the effects of gravity and keeping close track of the numerical quantities involved we have established some rules respecting forces, energy and interactions, all of which allow us to work with gravity as we find it, but there it stops.

Since matter and energy are manifestations of Reality entirely within the Twelve parameters, we must look for explanations of their behavior within the structure of these parameters, and regardless of any ideas to the contrary this is where we will find it!

The field fabric sets up three, and three only, fields which are capable of exercising forces on the field structures which constitute matter and energy, so gravity must be due to the operation of one or more of these three fields. The fact that observation indicates that gravity falls off as the inverse square of the distance indicates that it is essentially an electric field, divergence. The fact that we cannot cancel it out by the application of the electric fields to which we have access is due to the fact that we cannot make the canceling field coherent, and the best we can do is to integrate the effects of the fields, not the fields themselves, to produce an opposing force in a limited region.

The inertial approach involves the application of a particular tempic field gradient, carefully adjusted so that its effects are consistent with observation, but this implies certain flexibilities in the space fabric inconsistent with its established linear nature.

Another inertial concept of gravity is the all-pervading micro-particular gas, the units of which impinge on matter and through an exchange of momentum press the matter together. The difficulty of this concept is the necessity for explaining the inflow of energy to matter and implies either an energy sink within matter or an obscure energy exchange phenomenon between the regions within and without matter.

When the basic particle was being considered, it was established that four kinds of particles were possible: right hand and left hand spin and right hand and left hand precession, which gave particles having positive charges with plus and minus increments, but all having the same magnetic moments and tempic fields. Within these particles, and within systems made up of them as atoms, etc., there is field coherence, so that there are specific values for these fields determined by the particles themselves, and outside of them the fields will also be quite specific.

Looking at the model of the basic particle it is noted that the electric field is a dynamic condition resulting from the mutual interaction of the three basic fields. But since the tempic field is a gradient it is in itself not "motional", and the radial component of the electric field being divergence and having no component along either of the tempic field gradient directions also is not motional, and these fields are essentially static so long as the particle itself doesn't move or change. However, the skew component of the electric field, due to the precession, does have a component along a tempic field gradient and is motional. Therefore, field coherence is possible within the static structure due to spin, but not within the dynamic structure due to precession, unless the configuration is such that the skew field can comply with the half-and-half Form condition.

It is fairly obvious from the foregoing that only matter having the same direction of precession will assemble into large aggregates, first, because of the selective action of the differences in forces resulting from the differences in electric charges, and second, because the interpenetration of particles of opposite precession will introduce an asymmetry in the system resulting in its immediate conversion into radiated energy. There are, however, a few special configurations

where fairly large aggregates are involved where the initial fields already had an asymmetry which could be offset by the asymmetry introduced by the particle with the reversed precession and the whole system may be stable. Consequently, in the evolution of our universe we would expect a separation process to take place which would result in matter of essentially the same precession congregating together, and a fairly quick conversion to radiated energy of particles of opposite precession which happened to wander into such regions.

In considering the integration of basic particles to form the larger units of matter, there is a slight advantage for the particles with the larger total electric charge to so integrate, because suitable configurations will permit coherence of the skew fields. In any aggregate system such as a planet, there is bound to be a continual circulation of particles, both basic and composite, so that after many cycles of such circulation most of the big ones congregate in the nuclei and the little ones take up outer positions. This is the condition which we find now, as we inspect the matter to which we have access.

When the forementioned separation has taken place and most of the particles of opposite precession have been eliminated, we find that the system contains nuclei having one specific charge with electron shells having the opposite charge. The matter on planet Earth has positive charges dominant in the nucleus and negative charges in the shells, and as free particles. Elsewhere in the universe there will be an aggregate of the converse relationship.

An aggregate of matter such as we have on Earth, where the sort-out is reasonably complete, will be electrically neutral so far as the electric fields are concerned, and may or may not have a magnetic moment depending on how random is the orientation of the various particles, again determined by the summation of the effects of the fields, and a tempic field which will be the direct scalar summation of the many contributing tempic fields. It will also have the skew electric fields of the same polarity as the nuclei.

With the exception of the skew fields, all the other external fields of the aggregate may be considered as static because they have no component of the tempic field at right angles to them. The skew fields, on the other hand, are dynamic because they do have a quadrature tempic field component. Furthermore, the skew fields are largely incoherent simply because the normal almost random orientation precludes their meeting the half-in requirement of Form to become coherent.

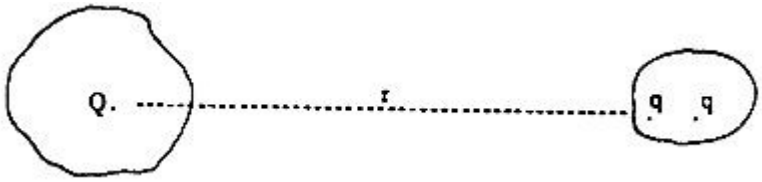
Since the skew fields do have a tempic field component at right angles, they will generate an electric field throughout the entire region, of the same polarity as the static electric field to which they are additive. Such an aggregate may be considered as having two electric fields, one of which is subject to cancellation by surrounding electric particle fields, and the other not so subject. Partial cancellation is possible, and if the aggregate is left to its own devices will be attained, by a surrounding shell of particles of the opposite polarity, so that externally to the entire system the effects of the fields will be a minimum and electrically neutral.

However, if another aggregate of similar precession enters the vicinity, such cancellation can no longer be approximated, and the skew field induces an electric field within this aggregate which amounts to an electric field distortion or "polarization". A convenient way of discussing what happens is to consider the skew fields and the polarization in terms of electric "charges" even though this concept is not strictly correct.

If the primary aggregate is considered to have a charge which induces the polarization in the secondary aggregate, this polarization will be equivalent to a charge displacement such that the product of the displaced charges and the distance through which they are displaced will be a statement of the amount of polarization This will be located in the electric field of the primary

aggregate and will have two forces acting which will be numerically equal; one maintaining the polarization and the other between the polarization and the primary field. Therefore, the net force will be the product of the primary field divergence and the square of the polarization in the secondary aggregate. There are of course other ways of establishing this relationship but they all say the same thing in other words, which is that Gravity is a dynamic field function and is the product of the gravitational field divergence and the square of the polarization induced in the attracted bit of matter, with the gravitational field being merely the skew electric field.

For the mathematician the following is offered:



Polarization in the attracted bit is q(q dr)

Equating forces $q(q\ dr) = Qq/r^2 + Qq/(r + dr)^2$

Gravity $F= Qq/r^2 + Qq/(r + dr)^2 = (q\ dr)^2\ 1/r$

Having established the nature of Gravity and is "formula", we may now see what can be done with it. Since it is essentially an electric field phenomenon, albeit not an electrostatic one, its distribution and behavior will be much the same as any other electric field, except for its dynamic characteristic. Altering the polarization will alter the force exerted by gravity, but because this is a square relationship, no such alteration can make the force negative (operate in the opposite direction). However, altering the divergence will alter both the magnitude and direction of the force, and the trick for controlling gravity is precisely this.

Since the gravitational field is due to the skew electric field, or stated differently, to the induction from the motional electric field, this is the logical region to explore for the mechanism by which fields may be produced to combine with the gravitational field to produce a resultant having a divergence more to our liking.

In taking a quick look at the gravitational relationships of the basic particles alone there are some interesting aspects. Since in an established region practically all the precessions are the same, the free particles will have a motional field of polarity the same as the particles making up the composite ones, and therefore they will be "repelled" by gravity. This repulsion, however, will be quite a bit less than the electrostatic attraction, so a compromise position will be established at such a distance that everything will be in equilibrium.

In the atomic structure there are therefore the electric field forces holding the electrons onto the nucleus, the magnetic forces fixing them in position, the gravitational forces tending to push them away and resulting in a compromised location, with the tempic field contributing to the dynamic conditions within and contiguous to the structure. All these forces have been developed from the basic concepts already put forward and are possible of confirmation by experiment if we ask nature the right questions. These same forces extend beyond the atom into molecular chemistry, crystal forms, and amorphous aggregates. These dame forces exist within the atomic nuclei together with others resulting from the interpenetration of the fields and their coherence. Matter, though magnificently complex is elegantly simple in its basic structure when understood.

Definition of Unusual Terms

Aggregate ~ The physical assembly of particles as separate units.

Amorphous ~ Assembly of matter in which control is largely random.

Awareness ~ The relationship between a Being and all else.

Coherence ~ The condition when two or more fields of the same king and direction combine into a single field.

Creator ~ The primary Cause for the existence of Awareness, Reality and its perception.

Crystal ~ Assembly of matter in which control is largely sequential.

Fabric ~ Grouping of three of the basic Parameters according to derivation and contiguous characteristics.

Integration ~ The summation of bits of the same kind into a whole.

Parameter ~ One of the twelve basic principles upon which all Reality perceived by Awareness is based.

Percipitation ~ Bringing Reality totally within the Perception of Awareness.

Personal ~ Pertaining to the identity of a Being.

Plasm ~ Assembly of matter in which control is largely free will.

Quadrature ~ A special operation by which a broadside (at right angles) relationship is established.

Skew ~ The geometrical configuration in which certain fields have tangential as well as radial components.

Tempic ~ The field parameter of Change

Tensor ~ Pertaining to a configuration of radiated energy which is self-contained.

Section Two

The Q Concept

If we consider the fraction 2/3 we see that we are comparing the number 2 with the number 3. Nothing is said about the reality to which each number applies, beyond the implication that both numbers apply to the same reality. If, however, they do not apply to the same reality, then one of two things result: i.e., a conversion must be made or we agree that we cannot deal with the situation.

Suppose we are considering 2 apples and two pears. They are both fruit and have many features in common. The fraction 2/3 tells us that of the 5 fruit, 2 are of one kind and 3 are of another, and that we have 2/3 as many of one kind as we have of the other, and 3/2 of the converse.

If we rewrite the fraction in the following form 2/3|5 this nomenclature will tell us all of the above in one glance; namely, that we have 5 articles, having a factor in common which we are comparing, and that we have 2 of one kind and 3 of the other. Written 3/2|5 tells us precisely the same thing except that the order of comparison is reversed.

If we write i2/j3|5 we realize at once that 2 somethings lie along the x axis and 3 somethings lie along the y axis, but that we are considering their numerical values only.

If we write i2/j3|5 we realize that we are comparing two vectors in a quite normal manner. In fact, we are so familiar with vectors that the mere presence of the i and j notation tell us the whole story with respect to these two vectors. Therefore, the vertical line and what is to the right of it may properly be omitted.

Consider next the problem of zero and infinity. If we define infinity as the largest number in which we have any interest and zero as the smallest number in which we have any interest, and if we maintain exactly the same degree of interesting both, then unity must lie exactly halfway between our zero and infinity. We may tell this story in our nomenclature as follows: 0/00|1 or 00/0|1.

Consider next the situation with respect to differentials. The quantity dy/dx implies that there exists a relationship between y and x and that there are no aspects not included in this relationship. If, however, there are unrelated aspects, then dy/dx implies that only the related aspects are being considered. To a limited extent we get around this difficulty by "conversion factors" or scale constants, but these means do not allow us to cross the gap between one type of reality to a totally different type.

If we write sy/dx|A we are saying that A describes the relationship between y and x which we are to consider. This relationship may be ANYTHING.

The foregoing, though interesting, is not essential to the handling of ordinary concepts and their mathematics. However, there are certain transcendental concepts which do not lend themselves to a mathematical analysis unless we use such devices to orient them within the framework of the mathematics we have learned to understand.

We are all familiar (or think we are) with the term "NOW" meaning the present. We speak of the past, present and future and consider "now" as the bracket in time with which we are immediately concerned. However, no matter how precisely we define it we cannot establish exactly what the present or now really is, except that it is vaguely a dividing point between the past and the future. Nevertheless, we know quite well instinctively that we are living in the present and it is a perfectly real and satisfactory situation. Furthermore, we are advised that, to a disembodied entity, the present is the complete reality and the past and future merely arrangements of events in the broadest sense.

If we write Future - Past = Now, we are saying that "Now is a very small differential between two very large items". A more proper expression is: Future - Past/Now|90° where we show that the present is actually in quadrature with the Future-Past, and hence need not be a small differential at all, but can assume the proportions which we instinctively know it to possess.

If we use the symbol Q for this quadrature concept we can write the above as:

$$\frac{F - P}{N} \Big| Q$$

which tells us the whole story regarding this relationship and leaves us satisfied that it is all in the proper perspective.

We know that spin itself, the divergence of spin and the curl of spin are all mutually at right angles. Therefore, any inter-comparison between the three fields presented by these quantitites should properly be written with the Q concept included:

De/dm|Q dm/dt|Q dt/de|Q

Incidentally, our observation of these three fields is always in quadrature. This is quite apparent with respect to time as set forth above, but a little consideration is necessary to appreciate that it

also applies to the other two basic fields as well. This concept is even more necessary when learning to appreciate the higher dimension. Without it we cannot deal mathematically with the relationship between fields and, say, free will.

Here it should be emphasized that the Q concept extends beyond mere quadrature, or kind. It actually embraces the relationships existing among whole families of aspects of reality.

Consider the twelve dimensions of Deity, oriented in four fabrics of three each. Ordinarily one would not consider any dimensional relationship to exist, say, between the electric field and probability, but these are truly related through the Q concept. In fact, the Q concept is the only relationship which does in fact exist between the various dimensions.

Again, we have defined a field as any region which has a unique characteristic. If we extend our concept of a region to include the abstract as well as the spatial idea, then all twelve of the dimensions become fields. Admitting this, the Q concept must exist between the various dimensions incorporated in the analysis.

Let us look at an example:

$$\left(\frac{d}{dx} + \frac{d}{dy} + \frac{d}{dz}\right)^{2R} = \left(\frac{d}{de} + \frac{d}{dm} + \frac{d}{dt}\right)^{2R}$$

is a valid equation only if both sides, and everything on each side, refer to the same aspect of reality or a Unity relationship exists between all of the components. Note the resemblance of this equation to certain electromagnetic wave equations, which are in fact particular cases of this general case.

Employing the Q concept, this equation becomes

$$\left\{ \frac{\left(\frac{d}{dx} + \frac{d}{dy} + \frac{d}{dz}\right)^2}{\left(\frac{d}{de} + \frac{d}{dm} + \frac{d}{dt}\right)^2} \middle| \; Q \right\}_R = 1$$

Section Three

Principles & Technology of Other Races

[Assembled from disclosures made by space people in various communications made to W. B Smith, and others with whom contact has been established. Data is arranged in logical rather than chronological order.]

Part 1

Fundamentals

1.1 ~ The Structure of Meaning

Meaning is something which we generally take for granted. It is something with which we live day by day and which we usually have no occasion to define. In fact, a strict definition might be exceedingly difficult to evolve. To try to attach a meaning to meaning is very much like trying to pull oneself up by one's bootstraps. We could say that meaning is a way of conveying

understanding, or that understanding results from the successful of meaning. Understanding itself is something that begs definition.

Our knowledge of the physical world is acquired in two ways: by physical experience, and by conveyance of meaning by others. In either case it can have two results. The knowledge can simply be stored to be regurgitated on demand, or it can be understood. There is a vast difference between these two aspects. In the first case the action is much like a phonograph or the memory box in an electronic brain. The stored data is usable only in the precise form in which it was deposited, any change whatsoever being tantamount to error. In the second case, however, since the data is understood, it can be used in any form whatsoever and in any combination with other data which is understood.

Obviously, understanding is enormously more useful than mere memory storage. Where memory bits can be used only one by one, or in combinations which have been established in memory, understanding permits use in all sorts of permutations and combinations: "The greatest wealth which can be acquired by man, is a complete understanding" (A-lan).

An example may be used to illustrate these points. Of a blind person who has never enjoyed the use of his eyes were handed a lemon and told that it was yellow, he could feel its shape, texture, hardness and smell or taste it. Thereafter, if handed a similar object he would be fairly capable of telling someone else that it was a lemon and that it was yellow. However, he probably would have no understanding of yellow.

Three things are necessary to understanding, that is for data to have meaning. First, the data must actually reach the recipient accurately, and this is not nearly as easy as it looks. It must reach him either through his physical senses, or through direct mind contact, both of which are subject to distortions. Second, the recipient must be coded to receive the information. That is, each bit of information must be significant to him; it must have its own meaning in its own right. Third, the recipient must be able to process the data, which is the fitting of it together until it becomes an integrated whole, which is meaningful and self-consistent. To these three major steps may be added a fourth, which is essentially the cross-checking of meaning with others who have been exposed to the same data.

There exist many aids to understanding, such as formal logic, mathematics, computers, and methods of thinking which in themselves are close to intuition. In what follows, use will be made of any and all aids to understanding. However, it cannot be stressed too strongly that in nature there are certain fundamentals upon which all else is predicated, and an understanding of the more complex cannot be attained until the fundamentals are completely understood. And this does not mean merely committing to memory certain formulas that appear to work.

When properly understood, this universe in which we find ourselves is beautifully simple. It is not at all the mathematical monstrosity with which we are accustomed to deal in our conventional science. True, the basic principles are foreign to our scholastic training, but they are strictly ion accordance with what we know instinctively to be true. We are actually born with a better understanding of our universe than we boast of after a college graduation.

In formal geometry we base our reasoning on certain axioms, which we hold to be self-evident truths. The fact that we can build an integrated, meaningful, and self-consistent whole on these axioms gives us confidence in them. What would our attitude be if we found that the farther we advanced in geometry the more corrections we had to apply to make things come out right? We most certainly should question the validity of our precious axioms, or our methods, or both.

In our conventional science we have assumed certain things to be self-evident, and we have built a very complicated structure on them. We actually are finding, however, that we have to apply more and more corrections to make our philosophy work. In fact, we now apply so many corrections that we have formed the habit and consider that to do so is perfectly natural and in the orderly course of events. We are so far along this road that it is difficult even to look back, let alone to return to our axioms for a reappraisal and maybe a fresh start.

In what follows a complete new start is attempted. No apology will be made for this approach, and no explanations will be given beyond those believed to be necessary for an understanding of the subject. As a matter of fact, a useful preliminary ceremony would be a good brain washing. It should be remembered that no one can really teach; they can only help others to learn.

1.2 ~ The Rectilinear Concept

As a first consideration let us consider what space appears to be to us. We have no doubts about its volumetric nature although we have no senses by which we can observe this condition. We conclude that space is volumetric by the nature of things which we find in it. What would it be like if everything were removed from space? Would we even have space?

Can we conceive of a space structure completely devoid of matter or energy in any form; real empty space? What would such space be like? If we were disembodied entities located in such a space, how could we identify our position or describe where or how we were? What sort of yardstick could we use? These and many more similar questions must be faced squarely by those seeking understanding.

When one has satisfied himself by actually doing it that he can conceive of space with absolutely nothing in it, and is not too terrified of his creation, he is then in a position to take the next step, namely to find his way about in it.

An arbitrary decision can be made to refer all concepts to where the investigator conceives himself to be, thereby establishing a point. He can next conceive of an adjacent point, thereby establishing a line. By turning in various directions he can establish the concepts of surfaces and volumes. But no matter what he does after that, the investigator cannot add more concepts to the space itself. He therefore concludes that what he instinctively felt soon after he first conceived the empty space, that it was volumetric, and nothing more, is correct.

The foregoing is actually an exercise in mental gymnastics, but as physical exercise is necessary for body-building, so are these exercises necessary for the building of understanding. It is absolutely necessary to satisfy oneself on these points before going on to the next concept.

The next step is to conceive of a way of getting about in this empty space, and to realize that one has done so when the operation is complete. The concept of an adjacent position, or point, is a good approach, and here again the operation becomes one of mental gymnastics, and a lot of manipulation and practice is necessary to get the feel of the situation.

As one gains in understanding of the properties of space, the various geometries become evident, and it becomes increasingly obvious that a wide variety can be made to work, if certain basic parameters are admitted. However, since our concern is primarily with our space and our universe, we will want to select the geometry that best fits our experience.

Ordinary Euclidean or rectilinear geometry is quite familiar and comprehensible to us, and we can understand easily how it can be applied to space as we conceive it. We can understand a sideways, forwards-backwards, up-down concept, or expressed mathematically, and x, y and z

axis. Also, we experience no great difficulty in conceiving of these three axes as converging at right angles to a single point and extending outward therefrom to enormous distances. We can even introduce the idea of infinity in any direction as being somewhat beyond the farthest distance in which we have any interest.

In our rectilinear concept we can conceive of such a thing as a straight line, although we might be hard put to define it, since the concept is in itself axiomatic. However, if we understand what a straight line actually is in our concept and we are sure that others with whom we communicate also have the same understanding, we can use it as a real datum point in our appreciation of our universe. This point is of particular significance in what is to follow, as it is one of the few solid anchors we have on which to fasten our understanding. Let us never lose sight of this concept of a straight line, as entirely distinct from the behavior of matter or energy.

Our rectilinear concept at once validates our Euclidean geometry. Furthermore, it removes any limitations which might be imposed on it by either great or small distances. It provides us with a clear-cut framework within which we can think our way about in space. We should satisfy ourselves that this concept actually is a necessary and sufficient condition for this purpose, although we remember that its selection was arbitrary and that other geometries probably would work just as well. However, since we have made our decision to use the rectilinear concept, we must be prepared to stick to our decision unless and until proved wrong. As a matter of fact, any geometry can be used, and will work within the limiting parameters of its definitions. It is only when extended beyond these limits that corrections become necessary, but even with the corrections the geometry itself does not become invalid, only the things we expect it to do.

1.3 ~ Relativity of Measurement

In our concept of space one of our first needs is for methods of measurement. We want to fix distances and directions, and we want to be sure that what we measure stays measured at the value we measure. We can agree upon some arbitrary distance between two points of which we can conceive, and make our measurements in terms of this distance as a unit, or standard, if you please. But can we be sure that the two points which form our standard stay put? And would it actually make any difference if they didn't? Is there any characteristic of our space which would tell us if our standard changed? As a matter of fact, if there were, such a property itself would make an excellent standard. We are forced to the conclusion that, (a) absolute distances in space as determined by properties of space cannot exist, all measurements being relative to some arbitrary standard, and (b) so long as ALL the measurements in which we are interested are made relative to the same arbitrary standard, it doesn't matter if they do change, as we have no way of knowing anyway.

To get ahead of ourselves a bit, we might discuss the use of the so-called constant quantity, the velocity of light, as a standard of distance. This implies two assumptions: (a) that some quantity, time, is fixed somehow so that a measurement can be made relative to it, and (b) that we can be sure that light will behave in a ladylike manner with respect to our rectilinear geometry. At first this may seem to be an attractive way out, but a little consideration will show that it merely trades one difficult problem for two more which are inherently just as difficult. These maters will form the subject of a later section where it will be shown that the problem is even more complex than appears above. Fortunately, there is a solution which is at once simple and satisfying, but a good deal of preliminary conditioning must be endured before this concept can be understood.

1.4 ~ Basic Reality

Having conceived of completely empty space and satisfied ourselves regarding the geometry of it and the limitations of measurement which are inherent in it, we may quite properly ask ourselves, how real it is it? Does our space, the space which surrounds us, actually have these characteristics? We know that our space contains lots of things we consider as quit real, and we may ask of what are they made, and what is their basic reality?

To conceive of an abstract quality and assign to it concrete properties and then call it a real substance is most unsatisfactory in the face of our notions regarding everyday matter. We would much prefer to have something more tangible as a starting point. Consequently, even though reality actually is a concept just as intangible as our rectilinear concept, it might assist understanding if some primordial quantity could be introduced as a medium of expression. The early postulation of ether and the still earlier Greek Ylm might fulfill this requirement. Both were considered to be all-pervading strictly continuous substances out of which matter was fabricated, and to have whatever properties were necessary for the formation of matter, without regard to how conflicting these properties might be. There is no fundamental objection to the use of such a medium of expression, since we will find that all references to it actually cancel out anyway. However, if it will serve as a crutch to help us in our first faltering steps, by all mean let's use it.

In our considerations of Ylm or ether we have something that is structureless, imponderable, and without boundaries, and in every sense intangible. Our concept of space provides a place in which we can conceive of the ether as being located, but by what manipulation can we convert this imponderable substance into ponderable matter?

Instinctively we know that we must make use of space as we have it, and that which we find therein, if we are to designate reality as distinct from the continuous background of ether. If we cannot designate some portion of the ether as being unique and distinguishable from all the rest, then we cannot say that we have established any degree of reality.

What is required then is for us to conceive of something which may be done, some manipulation which when completed will designate without uncertainty a certain region as being unique above all others, and therefore real. Ordinary spatial measurement we know to be inadequate since they are all relative to the arbitrary standard with which they were measured. Obviously what is needed is something which in itself is absolute: something that will display the same value no matter where or how it is inspected, something against which a measurement may be made with assurance that when made it will not change. Furthermore, to assume the arbitrary injection of such a standard merely begs the question, since we transfer the question of reality from the substance to the yardstick that measured it, without yet establishing the reality of the yardstick. No, we must find that for which we seek in our concept of space itself.

1.5 ~ The Concept of Spin

There is one, and only one, concept that is absolute in its own right in rectilinear space, and that is the concept of spin. The word should be understood in the sense of a manipulation, or process, performed within the concept of space as we have conceived it, or performed on the ether within it. Either approach is valid.

Imagine two points in rectilinear space, with a straight line joining them. Imagine that another line which started out coincident with the first is swung around one of the points until it is again coincident with its initial position. Something has been done, once, and the concept of it having been done is established. No matter how big or small our region may become relative to some

yardstick, the rotation once around remains the same. So also are absolute, multiple and factional rotations.

It is at once apparent that this concept of spin, extended through a place rotating about a line, and extending to infinity can be made to encompass our entire concept of rectilinear space. We can fill all space with a single spin, or any portion thereof, or we can fill it with many spins. Furthermore, we can conceive of the many spins being oriented in many ways, and having many manners of distribution. But the important thing to understand is that a region which is spinning is distinguishable from regions which are not, and that the actual spin is independent of any arbitrary standard of measurement.

At this point it must be noted that nothing is said about the rate of spin; only that spin takes place. Earlier we toyed with a concept of time which we held in abeyance because the concept added nothing to our concept of space and only posed more problems than it solves. We do not need to introduce time so long as we recognize the intervals of spin; that is, the relative angles of displacement at each comparative measurement. Understanding this point is vital to an understanding of spin. It will be shown later that time is a consequence of spin, and not something by which spin may be measured.

Having established the absolute nature of spin we may next question its reality. By reality, we understand the ability to distinguish the reality from all else, to be able to say what it is and what it is not, to say where it is and where it is not, to make it interact with other reality. In other words, reality is something which we can place in a definite mental compartment with reasonable assurance that it will remain there. We want to be able to think about reality as a unit, and not have it mixed up with or overshadowed by unreality, or unresolved background. If a concept meets these requirements reasonably well, we are reasonably happy with it and prepared to consider it as real. If we are to understand the reality of spin we must satisfy ourselves that it actually does met these criteria. Much of what follows is developed with this end in view, and in recognition of the fact that it may be difficult to accept the status of reality for something which seems to be merely a mental manipulation.

Even though the concept of spin may not be too acceptable at first as a basic reality, when its many properties are explored and found to coincide with observed properties of matter, and when from these properties may be predicted the laws which we know matter to follow, the status of spin most certainly will be enhanced and with increased understanding will come greater confidence in the beautiful simplicity of the rectilinear concept of space within which spin manifests as the basic reality. In fact, we will find that we need no further foundations upon which to build our complete understanding of the material universe with all its glittering apparent complexity.

Part 2

The Structure of Spin

2.1 ~ The Spin Mechanism

The concept of spin is fundamental in nature and is the only concept in nature which is absolute in its own right. The idea of spin has associated integrally with it the idea of units, multiples and fractions of complete revolutions, and these units are completely independent of any yardstick with which they may be measured. We can conceive of enormously large and enormously small numbers and these are applicable directly to spin, and have exactly the same significance with respect to any particular spin to which they may be applied.

Within any interval of attention spin may make many revolutions, one revolution only, or even a minute fraction of a revolution, without losing in any way its absolute nature. In fact, within any interval of attention, it need not actually turn at all, but merely display a tendency to turn, or be ready to turn. Or again, using our familiar concept of time (which incidentally we shall have to modify severely), we could say that one revolution completed in eternity would still be valid. On other words, there are no intrinsic limits imposed on spin, and we can think about it exactly the same way as we can think about any pure number, for that is precisely what it is: the basic number of our material universe.

In our concept of rectilinear space we conceived of a single spin being present, centered about a point and extending out indefinitely far, perhaps to infinity. We satisfied ourselves that it could involve all of our space, and probably would unless we chose to prescribe arbitrary boundaries, which could be relative to some arbitrary yardstick at best. So now we can do two things: study the structure of a single spin, and then the interaction of a plurality of spins, because we know by our experience with this physical universe that spins do interact.

At this point it might be well to make a blatant statement, and leave the derivation of it until much later, in order to facilitate understanding of what this discussion of spin is leading up to. Since spin is the only concept which we have in this universe which is absolute, it is fairly obvious that it must be the primordial building material of matter and energy, and a unit of spin must be the basic unit of these manifestations. All that we have in this material universe, whether matter or energy, is made up of spin, various units of which are fitted together in manners becoming to each and every form of matter or energy with which we are familiar, and many of which we do not even yet suspect.

2.2 ~ The Units

Consider first a single spin alone in space. Let us inspect it closely to see what we have. If our interval of inspection is sufficiently large we sill observe it to make one complete revolution, and we can assign to that interval one unit, and we may subdivide the unit to any extent we please, or we may observe it for a larger interval while it makes many revolutions. We have thus defined a unit for our interval.

It is fairly obvious that since linear distances in rectilinear space are purely relative, and spin is absolute, the interval of a unit of spin, or any fraction or any multiple of it must be precisely the same regardless of the relative distance from the center of spin that the observation was made. This point is of vital importance in the understanding of the origin of time.

Furthermore, uniform subdivisions of an interval of spin must all be identical. This is almost axiomatic, since if it were not so how could we tell anyway?

In our conceptions of space and spin we must understand that we are not limited in any way to numbers in the vicinity of unity. We wish to establish relative values of unity to construct useable scales, but there is no necessity whatsoever to confine our thinking to the middle register of numbers. In fact, we will find that nature runs the gamut of numbers from the infinitesimally small to the enormously large, for all practical purposes from a real zero to a real infinity. Therefore we can construct our practical scales where convenient.

2.3 ~ Distribution of Spin

So far, in our conception of spin, we have considered it to be distributed uniformly throughout our rectilinear space. We have tacitly assumed that angular displacement within any interval would be constant. However, under this concept it is apparent that the farther one goes away from the center of spin, the greater will be the actual spin displacement, and the reality of the spin will obviously be located anywhere else than at the center of spin where we would suppose it to be and where it has to be if it is to be consistent with our experience with matter.

While we can conceive of many possible distribution of spin, only one is consistent with our universe as we find it. We cannot say whether or not other real universes can co-exist with ours having spin distribution different from that of our universe, but it is most unlikely that means would exist to detect them if they did. Spin in our universe is almost certainly evenly distributed, in that the spin displacement is the same regardless of the r elative distance from the center of spin. This concept is validated by the fact that conclusions derived from it are entirely consistent with our experience with matter and energy. If it were not so there would exist voids in our universe into which our matter and energy could not penetrate, and we know of no such voids although it is quite conceivable that they could exist. Certainly within the range of our observations on the behavior of matter and energy the concept of even distribution of spin displacement appears to be valid.

It is very important to understand what is meant by uniform displacement of spin, as this peculiarity of structure is responsible for all the characteristics of matter and energy with which we are familiar. Imagine a line in space being rotated around a point and away from another line through the same point. If both lines are straight there will be an increasing angle between the, the magnitude of which will be indicative of the spin. Bit with uniform displacement of spin in any interval there is just as much displacement of the line near to the point about which the turning takes place as more remote from it. This is a consequence of the relativity of linear measurements, and although related to the geometry of the spin must not be confused with it. The obvious conclusion is that the interval near the center contains more units than the interval farther out.

A natural question at this point is, just what is this interval about which we have been talking? It should be noted that the word time has deliberately been avoided, and for a very good reason. It is first necessary to establish the interval in terms of spin only, so that derivatives of the interval can have an absolute status. The interval itself can next be cut up into convenient and meaningful units, which are also absolute in nature. If we wish, we can call these subdivisions by the name time, but if we do we must realize that this time is not quite the same as the process which our clocks measure. It is truly the amount of spin contained in an interval of attention, and nothing more.

2.4 ~ Spin Velocity

In the consideration of the distribution of spin and spin displacement, reference was made to an arbitrary interval of attention. The amount of spin in this interval signifies the extent of happening, or amount of reality present. But since the interval is arbitrary while the spin is absolute, the unit of interval of necessity must be defined in terms of spin.

I = Interval
i= Subdivisions of Interval
n = Number of subdivisions
S = Spin
D = Spin displacement

From geometry D = S / rI

rI = S / D which is constant for all values of r. But n i = I, from which r n i = constant, from which it is apparent that n must be proportional to I / r if the values of i are to be all the same. By suitable choice of units, which is permissible since our interval is quite arbitrary, we can have n = I / r whence D = S / i.

The quantity D, which is spin per unit of interval, is spin velocity as referred to a unit of time if we wish to think of the subdivisions of the interval as time. This quantity, spin velocity or spin displacement, is a fundamental concept in nature, and although we may use many and varied units for n and i, the quantity remains fixed when once defined.

Spin velocity will be shown later to bear a close resemblance to the universal constant c, or the velocity of light, but it would be erroneous at this stage to say that this is the derivation of c, since there are other factors that also enter into its derivation. The real fundamental constant is of course spin velocity, and this is constant for matter and energy as we know them.

2.5 ~ The Tempic Field

A field is a region that has a unique characteristic. This definition is purposefully broad and includes all kinds of fields. It even includes fields of grain and battlefields. A broad definition is necessary since so far, all we have defined in the universe is a three dimensional space (region) and spin (characteristic). But we know that our space contains an enormous variety of things, all made of spin, and somehow we must explain them all, We will have to study all the characteristics of spin in our region of interest in order to do this. Therefore, we will tackle the job piecemeal and study each field separately, that is each spin characteristic manifesting in the region.

In the consideration of the distribution of spin and in the derivation of the spin velocity, it was pointed out that units of subdivision of an interval could be defined in terms of spin, and that the number of such units was always proportional to the amount or quantity of spin present at that point. Consider a region about a center of spin, extending as far as we please in all directions. The distribution of spin is such that more lies close to the center than farther away. Also, the units within the interval of attention follow the same distribution. This is then a unique characteristic in our region of interest qualifying it as a field, and in view of the fact that we may associate units of interval subdivision with our ideas of time, it would be proper to give this field a name having some kind of time significance. We will call it the tempic field.

The intensity of the tempic field is obviously the number of units of interval subdivision associated with the spin that is present at that point. The distribution of the field of course follows exactly the distribution of the spin that defines it. The more intense the tempic field, the larger number of units necessary to express it.

Because of its very nature, and being located as it is in a rectilinear space, spin must be both scalar and vector. That is, there will be a quantity of reality that does not involve direction, and various characteristics that involve direction as well as magnitude. By definition of the units by

which spin is measured these units must always be positive; therefore it is apparent that they cannot have direction, and must be completely scalar in nature, but always additive. However, because of the geometry of space and the distribution of spin, many of its characteristics will be vectorial.

The tempic field actually is the direct manifestation of spin, and like the reality of the spin quantity itself, is a scalar quantity. Its distribution throughout the space can, however, have directional properties and hence be vectorial. We could say that the tempic field is synonymous with the quantity of spin, although it would not be quite correct to say that the tempic field and spin were the same thing.

It would be well to remember that the entire concept of interval, subdivisions of interval, and tempic field, is necessary to enable us to conceive of spin as a real quantity and to make it possible for something to happen in our concept of rectilinear space. Our universe being what it is, a basic rectilinear or three-dimensional matrix, with the only absolute quantity of spin with which to populate it, means that regardless of what we might choose to call the various manifestations of spin they are none the less real and are the building blocks of our matter and energy.

In order to determine just where reality lies we might perform an interesting mathematical operation. Consider a system of spherical coordinates centered on our spin center, with q as the vertical angle and ø as the horizontal angle. Let r equal the radius and dv the element of volume.

$dv = r \cos q \, d ø \, r \, d q \, dr$

But since the tempic field intensity is proportional to I / r, the quantity of spin in the element dv is

$dq = k \, dv / r^3$

$dq = k \cos q \, d q \, d ø \, dr / r$

Integrating $q = 4pi \ k \log_e r2 / r1$

For unit radius $k = 1 / 4pi$, also note $\log e \, 1 = 0$

Hence for unit radius one half the total spin lies inside a sphere of radius1, and half lies outside. Also, the total quantity is 4pi times the quantity per unit volume. These figures will be seen to have significance later when the various other spin fields are considered.

Part 3

The Spin Fields

3.1 ~ The Significance of the Tempic Field

We have just satisfied ourselves that spin may be described or measured in terms of subdivisions of an interval and that these units may properly be considered as a field. We have called this field tempic field, rather than a time field, because time for us has a connotation that is not strictly in accord with the characteristics of this field. As a matter of fact, our clocks do not measure either time or tempic field; they measure entropy changes. If it were not for the fact that so much of the matter in our universe is behaving in a most ladylike manner, our clocks would indeed by quite erratic. It will be shown later that time may be altered through natural processes or manipulated by intelligent control.

Suppose again that we were disembodied entities, but this time located in space near where a certain quantity of spin existed. If our psychological time sense were reasonably good and we set about to explore the region we would find that it took us longer to explore a given relative distance near to the spin center than farther away from. Also, we would probably notice that if we moved at right angles to the line joining our position with the spin center it would take us just as long to develop a given angle regardless of how far from the spin center we might be. This is the true concept of time, reduced to its most basic form.

As disembodied entities we are able to prowl around the spin center and investigate its many aspects without disturbing it, and in order to understand it we must appreciate it as it is, not through a third or fourth hand effect as may be shown on some crude indicating instrument. When we understand the structure of matter then we may devise confirmatory experiments using whatever instrumentation we please, but until that understanding is attained, the proper tool is the uninhibited mind.

In our explorations of the region surrounding the spin center we would always find some spin, and it would always be present. It would never become negative or zero, although t might be quite small. But we would find that the tempic field intensity s such that it could easily fool us in regard to the amount of space which we had explored, particularly if we had used an arbitrary yardstick to measure it.

Again, if we used an arbitrary yardstick to measure the space, we would find that the spin density would be inversely proportional to the distance from the spin center, provided that our arbitrary yardstick didn't change. We would, however, find that the time taken to explore an equal volume close to the center was more than that taken to explore the same volume farther away. We might jump to the conclusion that time was fixed, and that the space was stretched or warped close to the spin center. This is precisely what happened when the Theory of Relativity was formulated. This theory is quite valid, provided it is used only in a region where the tempic field bears a simple relation to the relative linear scale; otherwise it can become frightfully complicated as all who have struggled through it can testify.

The Theory of Relativity, therefore, is really a special case where Time is held constant and everything else is allowed to vary if need be. Is it not ever so much simpler to recognize the field nature of time and have a rectilinear space which is straight forward and easy to understand, than to insist on a constant time with its attendant necessity for continually introducing and trying to justify such weird concepts as space warps, contractions, etc? The fact remains furthermore, that whether we like it or not, the tempic field exists and no amount of skepticism will make it go away.

3.2 ~ Simultaneity

In developing the properties of spin the term "interval" was used extensively. It was not defined except by implication. In fact, it would be most difficult to define it except in terms of spin itself. We could say, with respect to a single spin center, that an interval was a multiple or fraction (or unity) of a complete revolution, but this definition would not be valid when more than one spin center was under consideration, except in special circumstances. It is suggested that understanding is more readily attained if the term is always considered in this subjective sense, as "interval of attention", and merely brackets the extent of our consideration for the matter. This may seem to be laboring a point but a full appreciation of the term is essential for an understanding of simultaneity.

Since the tempic field and therefore time at any point is the result of the spin condition manifesting at that point the concept of simultaneity in its usual sense becomes somewhat ambiguous and requires redefining. There is no great difficulty when a single spin center is considered, or within a region where the tempic field is constant, but the matter is not quite so simple in other cases.

Consider first the case of a single spin center. Here simultaneity would be established by one or more straight lines converging on the spin center. In the practical case some means of direct observation or communication along such lines is implied. If this is not possible, then it is at once apparent that simultaneity cannot be established directly and may only be deduced. Subjectively, however, we can visualize the spin angle swept out within any given interval of attention and declare that simultaneity existed throughout that particular spin during that interval. It must be carefully noted that this simultaneity is quite separate from the amount of time that might have been included in the interval in the various parts of the spin, although measurable by any of the times.

Consider next a region that is relatively small enough that the tempic field is uniform throughout. Here it is fairly obvious that simultaneity exists throughout the region. Also, that within any interval of attention the amount of time existing is the same for the entire region. The surface of the earth very closely approximates this condition.

In anticipation of cases to be discussed at greater length later, let us turn our attention to something of a general case, where the tempic field is neither uniform nor follows a simple pattern of distribution. Subjectively we can declare that simultaneity exists throughout the region within any given interval of attention, but how are we to establish this fact? Obviously, throughout the region different parts will have different amounts of time within the interval, but unless we are able to observe all points separately, or have means of communication between these points, we will not know when to start counting the time at the start of the interval nor when to stop counting it at the end.

Although simultaneity is a concept which in itself is not difficult, because of the characteristics of spin that make up our universe, simultaneity cannot be established unless the interval of attention starts with everything in which we are interested located at a single point in space and finishes at another single point in space. This is probably the most fundamental concept in connection with the tempic field, and merely states that with respect to time one cannot have a cake and eat it too.

Suppose two observers started out from a point where the tempic field was t1 and one went immediately to a region where the field was t2 and the other went to a region where the field was t3. Suppose that there were three clocks that responded proportionately to the tempic fields, one carried out by each of the observers and the third remaining at the starting point. Suppose that, after a certain interval, both observers returned to the starting point and compared notes. They would find that the elapsed time as measured by the clocks was closely proportional to the fields within which they had been operating, any discrepancies being due to the transition periods between the various regions. Probably the two observers would disagree violently with each other and with the home clock as to how long they had been away, but with simultaneity established by common points of start and finish of the interval, they would be forced to admit that the time change was real. Otherwise, the time would appear to be absolute and simultaneity would be sacrificed.

3.3 ~ The Divergence of Spin

It was shown previously that the only reality that we have in our universe is spin. This reality is of course both scalar and vector. The total quantity of spin is scalar and represents the total quantity of reality. The distribution of this reality gives rise to another scalar quantity, namely spin density, and also to several vector quantities, including gradient, divergence and curl. There are also other tensor quantities as well. Spin density was shown to have the characteristics of a field, the properties of which were identified with a time aspect and the field seen to be that which gives rise to our phenomena of time, and therefore was called a tempic field.

It may readily be appreciated that since spin is centered about a point and has a distribution other than uniform, it must have a divergence. This divergence is identical with the result of the mathematical operation of the scalar product of the differential operator del, or unit differential vector with the spin unit itself. The mathematical development will be dealt with later when we come to the integration of these basic concepts with conventional science. With this subsequent analysis it will be shown why the electric field has the properties that it displays, and how they got there. Because, the divergence of spin is the electric field. Here again we have a fundamental principle derived and stated.

3.4 ~ The Curl of Spin

Having seen that the divergence of spin results from the mathematical operation of the scalar product of del and spin, we may next look at the vector product of these two quantities. This produces the curl of spin, and again the detailed mathematical developments will be deferred until we study the properties of the magnetic field, because the curl of spin is the magnetic field. This may come as something of a shock, particularly in the light of certain of our preconceived ideas regarding the structure of magnetic fields. However, skepticism has never yet made a fact go away, and the magnetic field is still the curl of a spin.

Incidentally, at this point we may inject a comment that was directed at our science and in particular of our knowledge of magnetism: "Scientists of Earth know an amazing number of things about magnetism which are not so!", and in the light of the understanding of the true nature of magnetism this statement is most appropriate. The two things that are possibly closest to our daily lives of the entire physical science are magnetism and gravitation, and these are the things about which we have the wildest misconceptions. One of our queer ideas about magnetic fields is that they are made up of lines of force that loop around and close on themselves. Undoubtedly we got this idea from playing with iron filings and a magnet. What we didn't see, however, was what happened inside the magnet. In fact, the field does not close on itself and inside the magnet it has exactly the same sense of direction as outside. These and many more features of the magnetic field will be demonstrated later.

3.5 ~ The Gradient of Spin

Having considered the mathematical operation of the unit vector del on the vector aspect of spin to obtain the divergence and curl, and having seen the significance of these operations, let us next look at the effect or consequence of the operation of del on the scalar aspect of spin. It is at once apparent that this will yield a gradient of spin and to this we must attach meaning.

We have seen the scalar aspect of spin to be the parent quantity from which our time is derived. The gradient of this quantity is therefore the rate of change over time over the incremental distance considered and in the direction decreed by the unit vector del. In writing this out we have

$G = dt / dx + dt / dy + dt / dx = dt / ds$

where t is the tempic field and s the distance in the direction of del. Inverting this equation, we have

$1 / G = ds / dt$

which we recognize immediately to be a velocity.

Of course we will at once ask the question, if this gradient is the reciprocal of a velocity, what is going where? The answer is that one spin center in the universe would be unstable and at once expand to infinity, but within the structure of our matter, the arrangement is such that these gradients precisely cancel each other out and stable matter results. This property the gives us the clue for the manner in which our matter is built up, and in effect is responsible for the ponderable nature of matter

It is interesting to note the relationship defining momentum, mass times velocity, which is, of course, mass divided by the spin gradient. Or, we can define mass as the product of the ponderability of matter and the spin gradient that produced it. Much more will be said about these and other relationships later.

Part 4

Multiplicity of Spin Centers

4.1 ~ General Considerations

We have had a superficial look at the behaviors of a single spin center and a peek at a multiplicity of spin centers. We know that our matter is made up of enormous numbers of spin centers, some of which are relatively quite close together, so let us now see what happens when there are a great many to consider.

In the first place, all the spin centers could be lined up; that is, their spin vectors could all be pointing in the same direction. In this case we would say that such matter is "polarized", and we would expect different properties than from unpolarized matter in which the spin vectors were randomly oriented.

It may be readily appreciated that at any point the effect of the summation of each of the fields due to each individual spin will depend on (a) the relative distance from the reference point to each spin center, and (b) the relative orientation of the spin centers with respect to one another. This consideration is apart from any "background" field that may be present.

Since spin is both scalar and vector, it follows that the scalar components will simply add up, while the laws of vector addition will be followed by the vector components, with one important additional consideration. The scalar addition must be performed before the mathematical operations with del are performed to yield the field conditions. This consideration is merely stated at this stage as being important. Its significance will be apparent later, but it has to do with the fact that spin, which is what is being operated upon, is in itself the only absolute quantity with respect to which the operation may be performed.

Another important consideration is to realize that spin centers are exactly what their name implies; they are centers about which the units of reality function. They are not particles. Therefore, the standard equations of vector analysis such as LaPlace's and Poisson's equations may not always be valid. These equations are derived on the assumption that the entire virtue of a particle is contained within the point center and its only influence is apparent outside of the

point. This is of course not the case, as the entire virtue of a spin center actually lies completely outside the point center, and may correctly be said to be everywhere except within the point.

4.2 ~ Summation of Scalar Spin

Consider first an aggregate or cluster of a large by a finite number of spin centers. At any point the total spin will be the scalar sum of all the individual spins at that point. The total resultant spin density will give the tempic field intensity at that point. If the reference is very far from the cluster, then the resultant tempic field intensity will appear to originate (approximately) from a single large spin center coincident with the geometry of the cluster. It will be found to vary intensely as the distance from this virtual center.

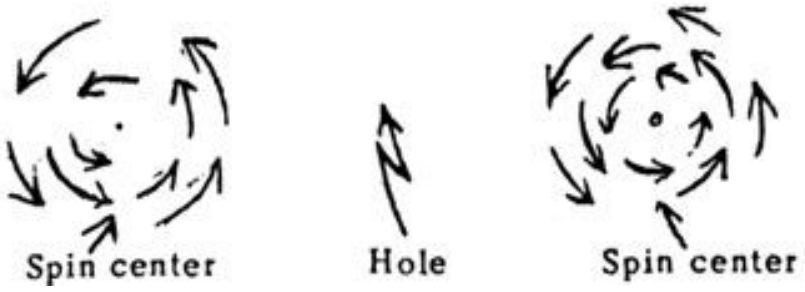
As the cluster is approached by the reference point, the tempic field intensity increases according to the inverse distance law until quite near, when it levels off to become nearly constant as the cluster is penetrated. The significant point here is that the presence of additional spin centers modifies the simple inverse distance law of spin distribution around a single spin center.

The exact description in any particular case can of course be worked out mathematically but at this stage there is little point in doing so as it is only part of the story and does not necessarily represent any actual condition of spin distribution. In practical cases there is always a "background" of tempic field to be considered along with the purely local consideration, and in addition there may be tempic fields due to "dynamic" relationships between the other fields present in the region.

4.3 ~ Summation of Gradient of Spin

We have seen that the gradient of spin has the characteristic of one over a velocity; also that the ponderability of matter multiplied by the spin gradient gives mass. It is not too difficult to conceive of configurations of spin centers that will produce extensive regions of reduced spin gradient. In these regions the apparent spin velocities become high, but since the physical distances involved remain unchanged, and spin velocity is constant, the effect is a decrease in the tempic field. In other words, holes are formed in the background of the tempic field, i.e., there is to all intents and purposes negative spin introduced. Surrounding these holes there will be represent all the characteristics of new, but negative, spin centers with their attendant fields superimposed on the fields of the original spin centers that produced the holes.

In a matrix of a large number of spin centers all oriented in the same direction, it is easy to see that there will be very nearly the same number of holes formed in the spaces between them. In the microscopic sense the gradients balance and the entire mass is stable. In the case of a large number of randomly oriented spin centers only a few will produce real holes, with the remainder producing "virtual" holes. These virtual holes are none the less real even though they lie in effect "outside" the spin centers responsible for their existence.



If we look at a pair of spin centers that are oriented in the same direction, we find a hole developing between them, and a "shell" of increased spin developing around them. On the other hand, if they are oriented in the opposite direction, a region of increased spin develops between them and a shell of reduced spin develops around them.

Here we must be careful to maintain a clear concept of what is going on. The scalar aspect of spin is its absolute reality and is either present or absent. It has no fixed direction or polarity. It adds up arithmetically to produce the total amount of reality present. The distribution of spin, however, is a function of relative position and its derivative, the gradient of spin, also has direction in that it is a scalar quantity measured in a certain direction. In the foregoing, the basic spin units remain unaltered by the presence or absence of other spin units, but the field structure associated with them is altered by the presence of other spin centers.

Where holes develop, there is no change in the absolute quantity of spin present, only a redistribution; a conversion of some spin from positive to negative, super-imposed on the background of positive spin.

We may ask what the difference is between a real and a virtual hole. A real hole develops in "polarized" matter where the gradient of spin is reduced in the space between the spin centers and increased in the region surrounding the spin centers. Consequently, since the ponderability of matter is proportional to the reciprocal of the spin gradient, such polarized matter loses ponderability while still retaining reality (mass) with respect to all outside consideration. A virtual hole develops in unpolarized matter and may have almost any distribution from a real hole to a completely virtual hole as in the case of opposite spin orientation. The one feature in common is that of increasing the ponderability of matter with respect to outside considerations.

Where there are available large numbers of randomly oriented spin centers patterns of real and virtual holes can develop, which when taken together with patterns resulting from other field considerations give rise to the structure of matter as we know it.

Part 5

[This part was not written]

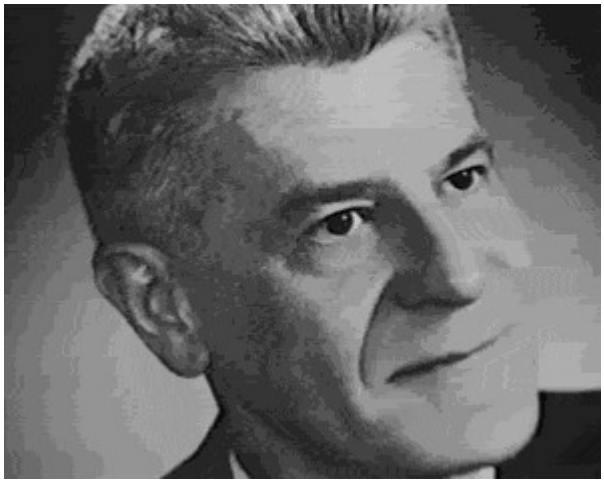
5.1 ~ Definition of Force
5.2 ~ Changing Reality
5.3 ~ Work & Energy

Wilbert B. SMITH

Gravity Control / Binding Force / Caduceus Coil / Geo-Magnetic Generator

Letters, Circuit Diagrams, &c.:

(1) Letter to Dr William Hooper (July 6, 1959)
(2) Letter to Dr William Hooper (July 21, 1959)
(3) Letter to Dr William Hooper (November 10, 1959)
(4) Letter to Mr Rideout (No date)
(5) Letter to George Williamson (November 25, 1955)
(6) Letter to Mr Middleton (January 2, 1955)
(7) Letter to Editor (John Campbell), Analog Magazine (1971 ?)
(8) Transcript of a Presentation by W. Smith (Date unknown)
(9) Electronic Circuits & Test Results
(10) Binding Force meter -- Speech
(11) The Future



Wilbert B. Smith

July 6, 1959

Dear Dr Hooper:

Your telegram was phoned to me just as I was getting ready to go on a field trip to determine the electrical conductivity of Lake Ontario, so I grabbed a handful of essays, put them in an envelope

and sent them off to you although I didn't have time to write. I hope there were sufficient copies, if not I have a few more and you are welcome to them. You certainly may make of them whatever use you can of this material.

We have rebuilt our machine and are now about to look for some of the answers to some questions. This unit has about 14 ceramic magnets mounted in a groove cut in a ¼ inch thick 6 inch diameter disc. We haven't yet run it up to full speed as we are very cautious after the other exploding. We don't expect much from this machine except maybe answers to a couple of pointed questions.

Our major design effort now is looking towards making a magnetic field move without having to move the magnets. It should be possible, since we found that the converse was true. Also, there are some rules concerning fields, which are not in the literature which might be exploited to attain this end. We refer in particular to the rule that field s can and will remain as separate entities if such arrangement has a lower energy level than that of the corresponding field structure. Also, we found that magnetic fields move only at right angles to their vectorial directions, and in strict correspondence with Maxwell's equations. They refuse stubbornly to move in their vectorial direction, and apparent motion in this direction is actually a folding in or out of the field, always at right angles.

We have drawn up quite a few designs to make the field move, but have discarded most of them either because the present technology was inadequate to do the job, or there was too much uncertainty as to what actually would be going on. We have one design which looks promising, namely notching a circular DC field with a (1 - cos O) function which is rotating and confining the whole in a shield so that the lower energy level is attained if the field structure rotates. We haven't tried it yet, and it will probably fall before we can test this principle. However, it looks promising.

With best regards,
W.B. Smith

July 21, 1959

Dear Dr Hooper,

I want to thank you for your kind interest in our gravity work, and to give you an insight into our current thinking. I am enclosing a couple of sketches of our "gubbine" and what we think is going on around it.

We visualize the magnetic field to have somewhat the configuration of the red lines, with somewhat more field outside of the ring than inside it. There are discontinuities in the magnet structure due to the fact that the individual vectors are square, but this seems to be an asset rather than a liability as it ensures that the field turns with the magnets, since a higher energy level will be required to bridge the gap between the [magnets ? illegible word] if it did not turn.

Rotation of the magnet-carrying disc causes the field to acquire a velocity throughout its structure, said velocity being directly proportional to the radius. The v x b will in all cases be at right angles to the velocity and the field vector and will be proportional to the magnetic field strength and the velocity. We hold that this condition will apply within the magnets and outside of them, since the magnetic field exists there also.

Following the above reasoning, it is apparent that a virtual gravitron will form on the outer edge of the magnetic ring and another of opposite polarity on the inner edge. The outer gravitron will

be somewhat stronger than the inner one, and the field configuration will be determined by the antecedents of the field (magnitude and direction of the magnetic and charge fields, reducing the gravitron field).

However, since the entire structure is immersed in the earth's gravitational field, the antecedents of which may or may not be compatible with the locally generated field, two complexes are possible, within a field structure or a field aggregate. Experiment must give the answer.

We have considered the use of a conventional gravimeter, but we do not think that it would be as good as the precision balance. The sensing element in the gravimeter is several inches from the bottom of the instrument, and since a table of sorts is necessary, it would not be possible to get the sensing element within a foot of the magnets.

November 10, 1959

Dear Dr Hooper:

I am very slow in replying to your letter of Oct. 6, but I have really been quite busy. I am sorry that I can't seem to explain my views on gravitational polarization lucidly, but the trouble is probably with me. I shall try to get something worked up to send you but I don't quite know where to start.

Our work here has been progressing slowly because of silly little mechanical troubles. We have built 5 commutators to swich the currents to produce a rotating field and there has been a serious difficulty with each. We are now working on a rolling mercury design which looks promising.

We did try to use the rotating field from the ceramic magnets to drag around a field produced by a coil and current, but there seems to be a problem with the compatibility of the antecedents of the fields, because the limits within which it will spin are apparently narrow and we have not yet been able to determine their magnitude or the rules governing this action.

Because of the commutator difficulties we have not yet been able to try the big rotating field, but we have it all built and if and when we get this last bug licked we should be able to look for a few answers...

Sincerely,
Wilbert B. Smith

Mr Rideout,

I read your letter of October 23 with appreciation and some amusement. It is quite apparent that my comments on time as a field function did not ring a bell. I am well aware that regarding time as a variable places modern science in the untenable position of trying to lift itself by its bootstraps; but I can only say that these are not my ideas but originates with those to whom our science resembles medieval superstition. I do not understand them fully and I have much to learn, but I have mastered a few basic principles and of these I am sure.

Time as a field function is NOT the same function as registered by our clocks, which record the changing entropy of a system, but is the function which makes this happen.

There is only ONE reality in our universe, and that is the concept of SPIN, and from this derive twelve dimensions. Twelve dimensions are necessary and sufficient to express our universe in its entirety.

Dimensions must include, as well as their vector direction, the component of reality in that direction for without the reality there would be no dimension.

Dimensions are arranged in four fabrics of three each, linked by a "quadrature concept". This is the structure that Relativity strives for by introducing the [square root of -2] between the space and time axis.

The concept of force is a fiction which we invented to stultify our thinking. It is merely a coverup for our lack of understanding of the interaction of reality.

The foregoing will probably sound most sacreligious to the ears of orthodoxy, but I don't mind in the least if these ideas are not immediately subscribed to. Science has a long and lurid history of reluctance to accept ideas which subsequently proved to be of great value.

We are progressing quite well in our gravity research, and ran our unit for the first time on October 26. The effect was measured on a precision chemical balance, when a brass weight increased from 24.4623 grams to 24.4628 grams when active material (cubic inch of aluminum) was 10 inches directly under the weight. Needless to say we have much yet to do and as soon as we have some relationships established we will prepare a suitable paper, a copy of which I will send you if you are interested.

Meanwhile, don't be upset about the above unorthodox ideas; they either click or don't click, and I am quite satisfied that we will come to them sooner or later.

Best regards,

Wilbur B. Smith

November 25, 1955

Dear George [Williamson],

I am glad that the coil arrived OK, but I am sorry that I can tell you very little about it. All I know is how to build it and that it worked. Apparently the hole down the center of the core is necessary for its proper functioning, as is an adequate power input. It will take a kilowatt comfortably, without heating at all, and we know that it will work on 100 watts, but it won't work for us on 30 watts. It just gets hot on the lower power! I don't know what the lower cutoff power is, nor do I know what the boys topside told me; "Play with it and learn".

Don Steadman built a simplified gravimeter which I have installed on a solid footing at home. It is quite interesting as there have been a couple of time field surges during the last month. Also when the Russians let off the Big Blast, there was a gravity wave which was so strong that it broke the quartz spring in the instrument! If the Yanks set off some bigger ones I fear for the consequences. People just don't know about these things. In the words of Jesus, "Father forgive them, for they know not what they do"...

I understand that plans are under way for a number of trips to pick up earth people for visits top-side during this coming few months. You might check with any of your contacts to see if they are involved...

As ever,

Wilbur B. Smith

January 2, 1955

Dear Mr Middleton,

Many thanks for your Dec. 4 letter...

In attempting to establish communication with the saucers, I can offer very little except to use frequencies which will penetrate the ionosphere. We have used the call M4 AFFA at frequencies around 20 megacycles. In this business we are all in the kindergarten and all I can say is to try anything and everything until something works.

We were told about a system which uses a radio transmitter as an energy source but a special antenna converter, which radiates doughnut-shaped waves, which are not time functions. We built a couple and find they have the most extraordinary properties. If you wish you could build a unit and try to establish a circuit to our group here in Ottawa. Following are the construction instructions.

One ferrite core, material with the highest permeability and dielectric constant, about 8 inches to a foot long, and about 1 inch in diameter. About 20 feet of plastic insulated #14 electric house wire. Starting at the center of the wire and at one end of the core wind on the wire as closely as possible, with the first turn under and then over, so that the winding will be exactly symmetrical. It will start at one end of the core and finish at the other end and will resemble a solenoid with a bifilar winding. It is important that the winding be exactly symmetrical.

When connected to a transmitter, treat it as any normal antenna for loading and tuning. There will be a few points of magnetic domain resonance which will be lossy but anywhere else the device will generate the required waves. It will not matter whether or not the antenna converter is shielded as the doughnut waves go through anything. The most remarkable property of this system is that the waves can be directly MENTALLY...

Yours truly,

Wilbur Smith

Analog Magazine **(Letters to the Editor)**[1971 ?] ~

...The coil is said to be a single winding of insulated copper wire, about #16 or #18 gauge, wound on a ferrite core of 1" to 1-1/2" diameter, and about 9" long. The coil is caduceus wound, that is, one begins the winding in the middle of the wire's length, winding the wire in opposite directions around the core and crossing the wires on the same opposite diameter points each time around.

The coil is said to be an energy sink --- that is, current fed into it just disappears, causing no radiation, even of heat. When operating and placed near a grid dip meter, the coil is said to show a large number of resonance points across the spectrum from 200 to 2.0 Mc. This coil is further said to have zero impedance. Further, two or more coils cannot be coupled together.

Transcript of a Presentation by W. B. Smith

(Date & Publication unknown)

...According to the theory of relativity, if I climb into a spacecraft and I set out from the earth at a velocity very nearly the velocity of light, and I go out to say, Alpha Proxima, and then I turn around and comeback, people on earth say that I've been gone something like 10 years. According to my clock, I've only been gone a year.

Now that is a result, apparently, of time dilation in the theory of relativity, in that the spacecraft in which I travel was moving relative to the earth at a velocity nearly equal to the velocity of light. The paradox arises when you consider that relative to the spacecraft, the earth was traveling away at exactly the same velocity. Therefore, to the people on the spacecraft, who are relatively stationary, 10 years should have passed, and by the time the earth comes back to them, it should have only been away a year. So you can see right away that the very premise upon which the theory of relativity is predicated --- namely, that if A is relative to B, then B must be relative to A --- leads you to an impossible paradox. This paradox is resolved completely if you recognize the variable nature of time, and as you move round from one part of the Universe to another you'll encounter all sorts of values of time in certain given intervals. We become slaves to the clock to the extent that we believe that the intervals ticked out by the clock are time itself, so we find it very difficult in readjust. Now I don't propose to say any more about this particular aspect, but I would like to say something on the subject of the craft themselves.

We asked them how they were supported, and they said they were supported on the earth's gravitational field. Further studies on our own, with occasional references to these people from elsewhere, and we figured out that we were able to go into the laboratory and conduct a series of experiments which proved beyond doubt that this is true.

Our laboratory experiments have allowed us to make about a 1% change in the weight of objects --- we can make them about 1% heavier or 1% lighter. Now that is a long way from holding a spacecraft up, because we have to go over 100% to do that. But the fact that we can do it --- the fact that the principles which these people from outside gave us and guided us to finding out for ourselves are valid --- certainly indicate that, first, these people are what they say they are, and, secondly, that their technology is that they say it is, that it is superior to ours and that ours is inadequate in many respects [Quite a lengthy description on the blackboard followed at this point].

Now we understand that these bells (Mr Smith is referring to the bell-shaped spacecraft said to come from Venus, which have been photographed by Adamski and others) operate on this principle. Underneath the bells are three things that people have referred to as landing gear. They are not landing gear at all --- they are spheres within which a charged sphere is rotating. It is spinning on magnetic bearings. Magnetic bearing is something else the people from outside gave us the design of. It is very simple in section, and this is the north pole and this is south, and in it they have a thing that looks like this, with a south and this is a north [Here obviously Mr Smith is again demonstrating on the blackboard]. They are simply ferrite bearings permanently magnetized. We built them ourselves and checked them in the lab, and they worked perfectly. They are very simple things. The spheres carry an electric charge and they spin on this type of bearings down inside these big balls. We are told that the tilt is simply produced by rotating the sphere a little it, which bends the field. The process is much more complicated than would appear from what I am telling you, but these are the first steps and the end results --- even hough there are other steps in between.

Now one other thing I would like to mention --- as far as I know, our group in Ottawa is the only group that has actually taken the information which was given to us by the people from outside and translated it into hardware that works. Much information has been given to us through

various channels, but people just talk about it. They don't do anything about it. I think that is deplorable. I think that when they give us information, the least we can do is to show our good faith by trying at least to convert that information into hardware.

We have built two items of hardware on their instructions, which I'm rather proud of. One of these pieces of hardware is a coil. It has a ferrite core, and a trick winding on it. To look at it, it looks rather like an oddly wound inductor. When measured on a radio frequency bridge, however, it shows very peculiar properties. There are certain frequencies at which it is impossible to balance the RF bridge, and that is a direct contradiction to what any electrical engineer will tell you should happen with a coil wound on a ferrite core.

The other item that I'm rather proud of resulted from a series of questions that we asked regarding accidental destruction or damage to our aircraft by flying into the vicinity of flying saucers. And we were informed that, although a few of our aircraft had come to an unfortunate end by what they considered the colossal stupidity of our pilots in flying into a region where the aircraft was bound to get into trouble, they said that they are now taking corrective measures and whenever they see one of our aircraft about to commit suicide, they just get out of the way and give him a wide berth. But I asked, if an aircraft was damaged or destroyed, what happened? They said the field surrounds the saucers in order to hold them up. In order to produce the gravity differentials, time field differentials are necessary to operate the ships. These sometimes produced field combinations which reduced the strength of materials to the point where they were no longer strong enough to carry the loads that the materials were expected to carry. Now as we know, aircraft --- particularly the military type aircraft --- are built with a rather small factor of safety, and if they fly into a region of reduced binding, the material is no longer strong enough to carry the load, and the craft simply comes apart.

Now we asked a series of questions about --- was it possible for our craft to detect these regions so that we would not fly into them, and they said that it certainly was, and they would do this very thing. They also told us that we ourselves were creating regions which were much more dangerous than the regions they established in their vicinity, because we could detect the presence of their craft and give them a wide berth, but we could not detect without instruments the presence of these vortices which we ourselves had produced. They gave us the design of the instrument (See Flying Saucer Review, march-April 1951) which was fundamentally this --- they said to select two materials, one stronger than the other, and to arrange so that these material pulled against each other in such a manner that the weaker material was very near its breaking point, and the strong material was a long way from its breaking point. On that basis we devised instruments, and we built a number of them in the shop and sent them around to various people that we know did quite a lot of traveling. We asked them if they would investigate the regions the regions through which aircraft must have passed just prior to breaking up in mid-air, and we have unfortunately large reports of our airplanes having done just this.

One of these unexplained crashes occurred at a place called Esandon, which is about 20 miles southwest of Quebec City. We investigated the region through which this BOAC aircraft must have passed just prior to its crash, and sure enough, --- big as life and twice as natural --- we found a very large and very strong vortex. Our instruments showed it beyond a doubt. It was about a thousand feet in diameter and roughly circular, with a rather sharp line of demarcation at the edge of it.

You will recall also that about two or three years ago, possibly a little longer, a jet aircraft crashed into a nunnery at Orleans, just out from Ottawa, killed a number of people and did a great deal of damage. In fact, the jet engine was finally dug out of the ground about 30 feet

below the foundations of this convent. Once again we found a very strong vortex of reduced binding. We had a number of reports come in from people in the field who found exactly the same thing. I wrote a very stiff **memorandum** to the appropriate people in my own department, pointing out some of these facts. I did not state where we got the information, but simply stated that we had instruments which showed the existence of these regions of reduced binding, and suggested that something be done about. The letter wound up in the "crank" file. I'm afraid that is the fate of most of these things --- they wind up in the "crank" file. However, that does not in any way change the fact that these regions of reduced binding exist. People from outside told us that they existed, they gave us the design of instruments, we built the instruments and we have confirmed the fact.

Question: Could you explain why they have curtailed the explosions of nuclear bombs?

I can only guess at why the nuclear explosions have been curtailed. I saw a picture which I know was never released to the public, showing a very large explosion in the Bikini series. This picture showed the enormous fireball which I think must have been well over a hundred miles in diameter, and shooting out from it were what looked like solar prominences --- in other words, they were great tongues of activity of some kind. Now these tongues looked to me, from the scale of this picture, to be around 25-50 miles. They were quite comparable in size to the fireball. Now, my guess is that these tongues or prominences were in fact chain reactions... [&c...]

Figures:

1. Sketch of iron core magnetic field
2. Apparatus of experiment 1 (a)
3. Apparatus of experiment 1 (b)
4. Graph of experiment 1 (a), excitor winding
5. Graph of experiment 1 (b), Bias winding
6. Apparatus for test in experiment 1 (c)
7. Graph of experiment # 2 (b)
8. Circuit for determining BH curves
9. Graph for Permalloy and iron cores --- Saturation curves
10. Circuit drawing of low excitation tests showing waveform and measurements
11. Graph of characteristic for Wattmeter (Millivoltmeter)
12. Diagram of Wattmeter #1 design
13. Calibrating curves
14. Diagram of Wattmeter #2 design
15. Graph of reactance curves for toroids
16. Phasing circuits for domain resonance tests

***New Experimental Investigations* : ... Exploration of Molecular Binding Force ... An Evaluation of a Molecular Binding Force Meter ... Mark1 Meter]**

Binding Force Discussion, Vancouver Speech, 1961

The other item that I'm rather proud of resulted from a series of questions that we asked regarding accidental destruction or damage to our aircraft by flying into the vicinity of a flying saucer. We were informed that although a few of our aircraft had come to an unfortunate end by what they considered the colossal stupidity of our pilots for flying into a region where the aircraft was bound to get into trouble, they said that they are now taking corrective measures, and whenever they see one of our aircraft about to commit suicide, they just get out of the way and give him a wide berth. I asked them what happened, and they said, well, there are fields around the saucers in order to hold them up, in order to produce the gravity differential, the time field differentials, which were necessary to operate the ships. These sometimes produced field combinations which reduced the strength of materials to the point where they were no longer strong enough to carry the loads that the materials were expected to carry. Now as we know, aircraft, particularly the military type aircraft, are built with a rather small factor of safety, and if they fly into a region of reduced binding, the materials are no longer strong enough to carry the load and the craft simply comes apart.

We asked a series of questions about whether it were possible for our craft to detect these regions so that we would not fly into them, and they said it certainly was and they would give us the design of an instrument which would do this very thing. They told us also that we, ourselves, were creating regions which were much more dangerous than the regions which they established because we could detect the presence of their craft and give them a wide berth, but we could not detect without instruments the presence of these vortices which we ourselves have produced. They gave us the design of the instrument which was fundamentally this: they said to select two materials, one stronger than the other, and they said to arrange so that these two materials pull against each other in such a manner that the weaker material was very near its breaking point and the strong material was a long way from its breaking point. On that basis, we devised an instrument and we built quite a number of them and sent them around to various people that we knew did quite a bit of traveling. We asked them if they would investigate the regions through which aircraft must have passed just prior to breaking up in mid-air. We have, unfortunately, a large record of our aeroplanes having done just this.

One of these unexplained crashes occurred at a place called Issoudon which is about 20 miles south and west of Quebec City, and we investigated the region through which this BOAC aircraft must have passed just prior to the crash. Sure enough, big as life and twice as natural, we found a very large and very strong vortex. Our instruments showed it beyond a doubt. It was about a thousand feet in diameter and roughly circular with a rather sharp line of demarcation at the edge of it.

You will recall also that about two years, three years ago, possibly a little longer, a jet aircraft crashed into a nunnery at Orleans, just out from Ottawa. It killed a number of people and did a great deal of damage. The jet engine itself was finally dug out of the subsoil about 30 feet below the foundation of the convent. We investigated that one — again we found a very strong vortex of reduced binding. We had a number of reports come in from people in the field who found exactly the same thing. I wrote a very stiff memorandum to the appropriate people in my own department pointing out some of these facts. I did not state where we got the information. We told them we had instruments which showed the existence of these regions of reduced binding, and suggested that something be done about it. The letter wound up on the crank file. I'm afraid that is the fate of most of these things, they wind up on the crank file. However, that does not in any way change the fact that these regions of reduced binding exist. People topside told us they existed, they gave us the design of instruments, we built the instruments, we have confirmed the facts.

There's one other little point that I would like to make in connection with these regions of reduced binding. That is, that the people from elsewhere told us that we make them when we set off a nuclear explosion. We make two of them. We make one of them in the vicinity of the nuclear explosion and one on the opposite side of the planet. Any of you who have ever seen pictures or facsimiles of a nuclear explosion have probably noticed that there is a column which is approximately uniform in diameter extending upwards from the region of the explosion, and that is capped by a big mushroom-shaped cloud. That shape, that fact itself should have been sufficient warning to us that we were producing a very serious gravitational disturbance. I'll show you what happens. (Draws on board.) That circle represents the earth. Out from the earth there is emanating, for the sake of simplicity, lets call it a gravitational field. We have a nuclear explosion take place at some point. A nuclear explosion means that there is a sudden change of matter to energy. In other words, we have a dMdT (mass-loss rate - Ed.) which is large, very much greater than unity. Now it is not difficult to show that if you have such a disturbance occurring in a gravitational field, there will be projected outwards a gravity wave which will be

projected in the direction of the gravity field and with a velocity which is inversely proportional to the strength of the gravitational field. Therefore, if the explosion itself, if the conversion of mass to energy, lasts over a period of time which would permit the expanding material to move out say, a hundred feet this way and a hundred feet this way, we would have a region 200 feet in diameter in which mass was being converted to energy and which would be a virtual source of a gravity wave that would travel straight up, thereby producing the column that we see supporting the mushroom cloud. What we don't see is that penetrating downwards through the centre of the planet there is a similar gravity wave which comes to a focal point down here. And in this region, from approximately here on down, we have approximately the same mass all the way around so that the gravitational field in here is very low. So the velocity becomes very high and flares out this way, so that it comes out on the far side of the earth as a diverging cone. Now these things don't go away. We literally punch a hole in the field structure of the earth; we punch a little round cylindrical hole on this side and a big conical-shaped hole on the other side. They stay there for a long time. They're vortices and it takes them quite a while to dissipate. We don't know how long, but we have gone back to places such as Issoudon three months later, and we have found that the vortex has gone. Now maybe it has moved away, we believe that that is what happens because we actually caught one of them moving, or maybe it dissipates, or maybe both. But we did find one out over the North Atlantic that drifted, that was picked up first by a friend of mine who is an RCAF pilot who had the instrument with him. They located it on a reconnaissance flight just to the south and west of Iceland, and then again on a flight out about a week later. It was about half way between Iceland and Newfoundland and considerably weaker. At least that is the impression they got from the instrument indication. So apparently they do move around and I presume they do fade out. We haven't, incidentally, located any in the last year or so, I presume because we have not been exploding any bombs lately.

We believe that, as long as the elastic limit of the material is not overstressed, the effect is temporary, but if it is overstressed, the effect is permanent. Now we found a very peculiar thing. Things in the northern latitudes generally appear to be somewhat stronger than they are in the southern latitudes. We have one instrument which we took from The Pas, Manitoba, through Ottawa, Washington, D.C., and out to Oklahoma City. And since none of our instruments are calibrated in any kind of an absolute unit, simply because we don't know how to calibrate them in absolute units, they are merely scale indications. The scale goes around to 10. And we set them ordinarily about mid-scale, somewhere around five or six. At The Pas, it went up to about 7 ½, assuming it was set at 5. When it got down to Oklahoma City it was down to 2. And when we took it back to Ottawa it came back to the 5. We had set it at 5 in Ottawa. Now that meant that there was not a permanent set in the nylon fiber, which was the weaker of the two opposing pulls. However, every time we take one of these instruments into Toronto, we find that it promptly goes from 5 down to 2. We have actually had several of the nylon fibers break when we've taken the instruments to Toronto. We came to the conclusion that Toronto was maybe good all right but it wasn't very strong (laughter). Incidentally, they have had an abnormal number of structural steel failures in Toronto when buildings have been undergoing construction. The steel has given way, bolts have given way. We believe that this is maybe a semi-permanent condition for Toronto because we find that we encounter it just as we hit the outskirts of the city, and as we proceed through the city and towards Hamilton, we lose it again about Port Credit. So this is a very large region and it seems to be permanent. I know it's been there for the four or five years now that we've been investigating.

http://www.treurniet.ca/Smith/TOC.htm

The Future

(Verbatim extracts from the Smith archive)

I am very disturbed by the current series of nuclear tests because sooner or later energies will be reached which can initiate the Vril reaction, which is the driving together of positive and negative charges to the anihilation of both. An electron driven into a proton will produce an overloaded neutron which will shatter into a long series of violently unstable mesons, until the whole is converted into energy, the majority of the quanta of which are more than sufficient to drive more electrons into protons, and so on. Furthermore,we do not know at what point the reaction will spread to matter other than hydrogen. Maldek.

You ask me why there is no official story about the reality of saucers. I think it is a combination of circumstances, the most important one being that it is not in the present sequence that we should be told. The present order with its distributed responsibility does not lend itself to readjustment in thinking or action, and any change must start at the bottom and work its way up.

Apparently, there are quite a few groups of space people operating in the vicinity of this planet, and while they have knowledge of each other they do not engage in extensive interchange of ideas. Some of them are working for the benefit of the human race, others to fulfil a "plan", and still others are merely "tourists". Something drastic is due to happen here shortly and I suppose it is natural that people would flock here to observe it.

I believe that there is something going to happen in the not too distant future and I am trying to figure it all out from the rather sketchy data which I have been able to gather.

Apparently, the time for us is very short and there are several groups who have an interest in the outcome. Most of them are friendly, but there is at least one bad lot who are bent on exploitation.

From the best information I can gather the space people are planning big events which should materialize shortly. I am not too clear on what they are up to and I would sure like to find out.

Something is about to happen which will be quite serious for the human race of the earth, and probably will have serious repercussions throughout the solar system. The space people intend to minimize the damage and ensure that our race does not perish. That we are rather primitive compared with other races, and under normal circumstances would be left to our own devices to grow up as best we could, but because of some impending crisis, they must now interfere in our affairs, but they intend to keep such interference to an absolute minimum.

There is one factor regarding saucers which Bender and several others knew, and which may not be stated at this present time, and extreme action may be taken to prevent such disclosure. Enough said. (Ed. - This is probably a reference to Albert Bender who was the first to be silenced by the so-called "men in black".)

There are many earth people who have each been entrusted with a portion of the new knowledge, but until certain events have taken place this information may not be assembled into the whole.

I suppose you know about the anticipated sunspot maximum? A statement was issued by Dr. Van der Pol of the C.C.I.R. in which he predicted, based on observations to date that there would be an unprecedented sunspot activity this year and next. ... I presume your friends have already told you much of this, although one group with which I have had contact is specially interested in this aspect.

I noticed several places in Dick Miller's story where words have rather obviously been carelessly used. Of course, I do not know where in the circuit the distortion entered but I strongly suspect the space people in their use of an alien means of communication. I refer particularly to the reference to cosmic rays. I do not think that was what was meant at all, but that the earth is moving into a region where strong electric, magnetic and time fields exist. A purely secondary consequence would be an apparent increase in cosmic ray count.

Affa tells us that many things are due to happen in the not too distant future, and a lot of them none too pleasant.

---

http://www.treurniet.ca/Smith/TOC.htm

Gravity Control Apparatus

The following photos taken by Wilbert Smith shows the construction of an experimental apparatus for demonstrating weight changes due to rotating magnetic fields. Click on the images to show a larger version.

Figure 1: This photo shows clearly an overlapping structure of the magnets around the circumference of the rotor. We know that the rotor is six inches in diameter, so we can estimate the size of the magnet wafers. Unfortunately, we do not have information on how the magnet poles are oriented.

Figure 2: This photo shows the connection to the motor driving the rotor. The red disk-shaped object on the ground might have been used to cover the rotor, perhaps for safety and/or to hold an object to be levitated.

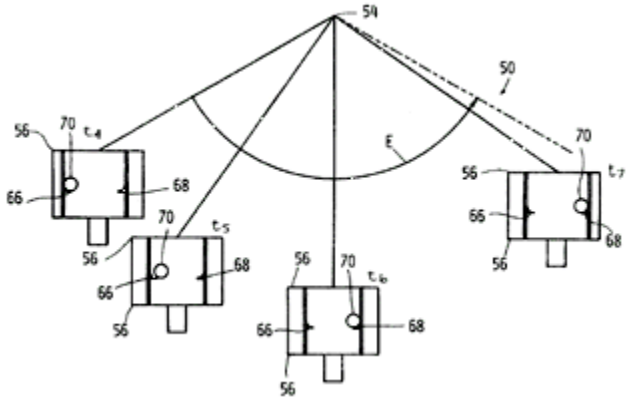
Figure 3: This photo shows the precision balance scale supporting an object suspended above the rotor. Note that the indicator is calibrated to its center position. The implication is that the rotor is not spinning.

Figure 4: Here we see the same scale and suspended object, but with the indicator deflected to one side. The scale deviation implies that the rotor is spinning, thus causing a weight change. Note that the suspended mass appears to be inside a glass tube to prevent air currents from affecting the measurement.

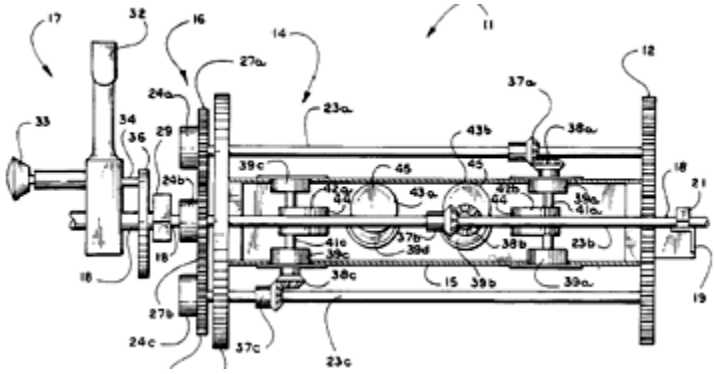
Mechanical Space Drive US Patents (Inertial Drives)

Inertial drives, impulse engines, centrifugal & centripetal propulsion, momentum transfer, motion rectifiers, non-linear propulsion, translational force generators, gyroscopic propulsion, directional force generators, & reaction motors, &c: various names for "bootstrap" methods & apparati that impart motion to a vehicle without reaction with the environment.

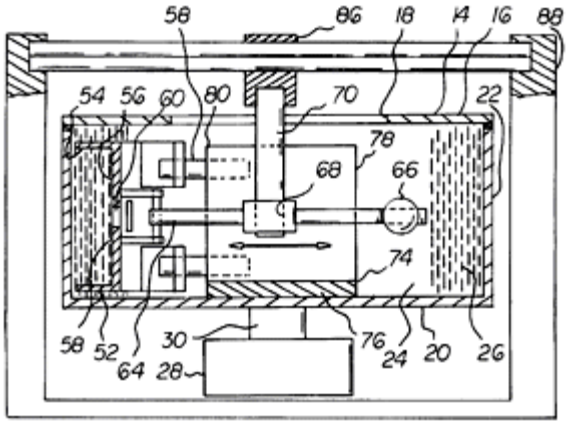
USP# 6,345,789 (2-12-02): Method & Apparatus for Propulsion
Rasmusson, James K.



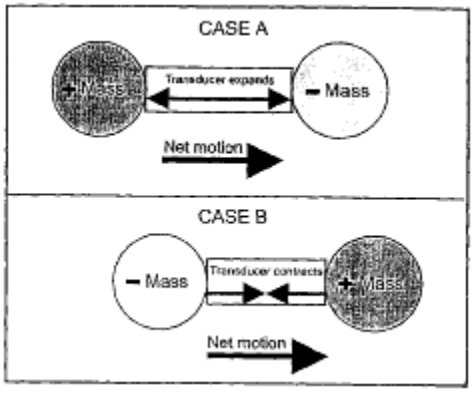
USP# 6,290,622 (7-18-01): Mechanical Force Generator
Murray, Lawrence D.



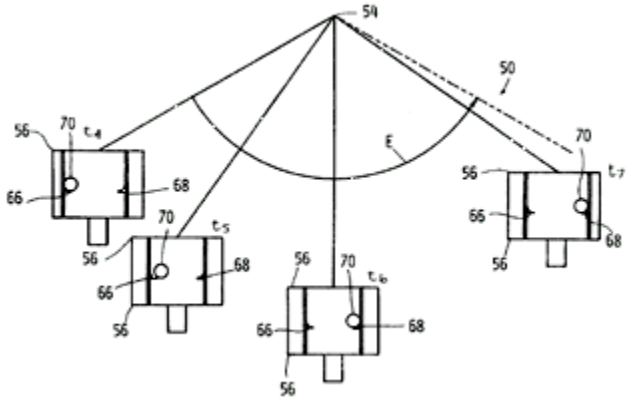
USP# 6,259,177 (7/10/01): Motion Imparting System
Deschamplain, David



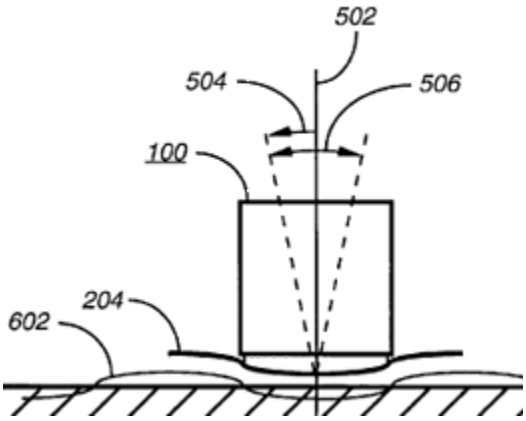
USP# 6,098,924 (7/18/00): Method & Apparatus for Generating Propulsive Forces
Woodward, James F., *et al.*



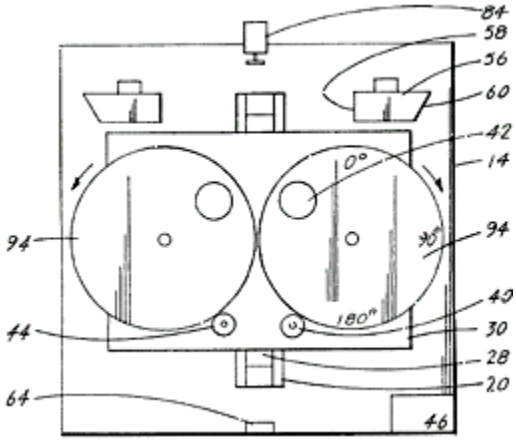
USP# 6,089,511 (7/18/00): Method & Apparatus for Propulsion
Rasmusson, James K.



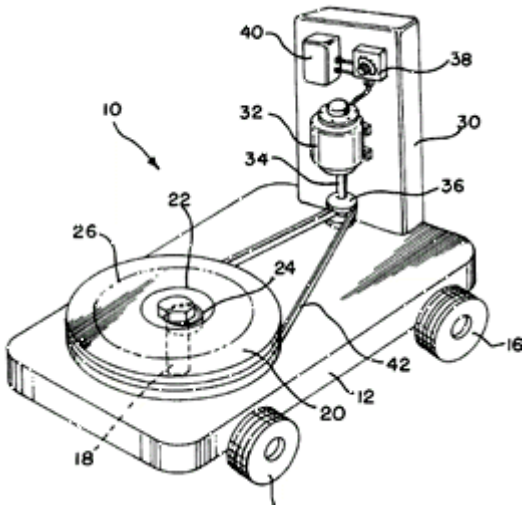
USP# 5,969,442 (10/19/99): Reaction Propulsion Motor & Apparatus for Using the Same
McKee, John M., *et al.*



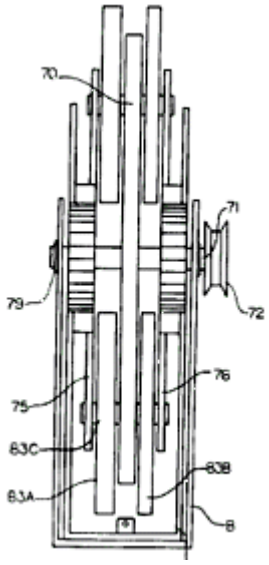
USP# 5,966,986 (10/19/99): Propulsion System
Laul, Virgil R.



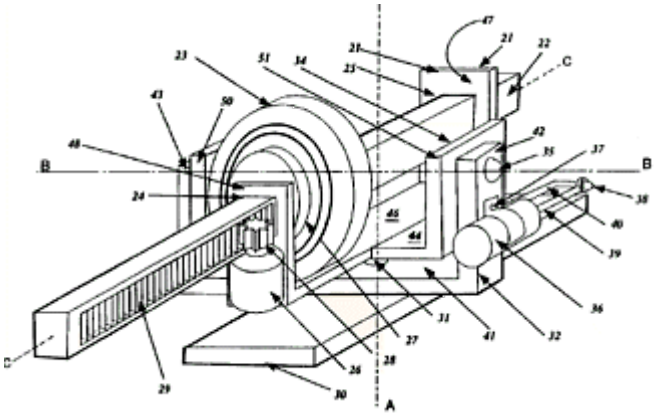
USP# 5,937,698 (8/17/99): Centrifugal Propulsion System
Kunz, William T.



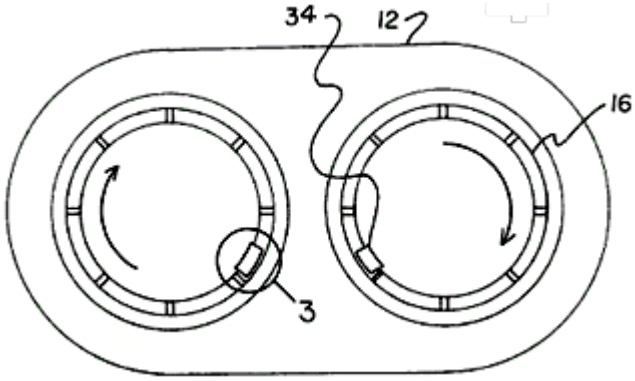
USP# 5,890,400 (4/06/99): Apparatus for Generating a Propulsion Force
Oades, Ross A.



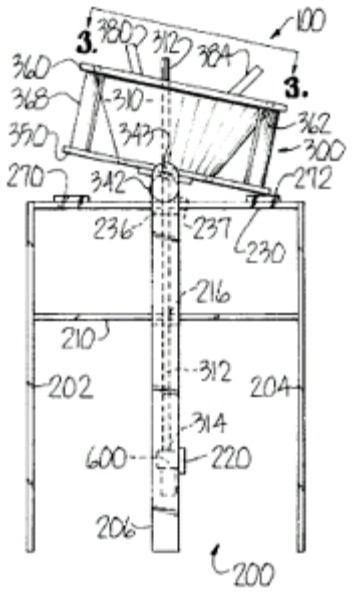
USP# 5,860,317 (1/19/99): Gyroscopic Propulsion System
Laithwaite, Eric R. & Dawson, Wm.



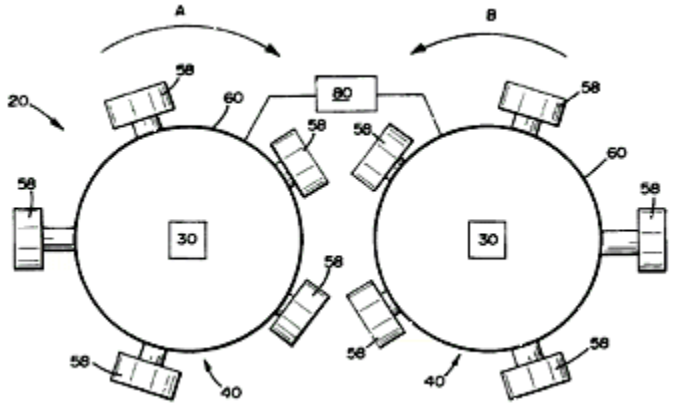
USP# 5,831,354 (11/03/98): Bootstrap Propulsion System
Stopplecamp, Timothy J.



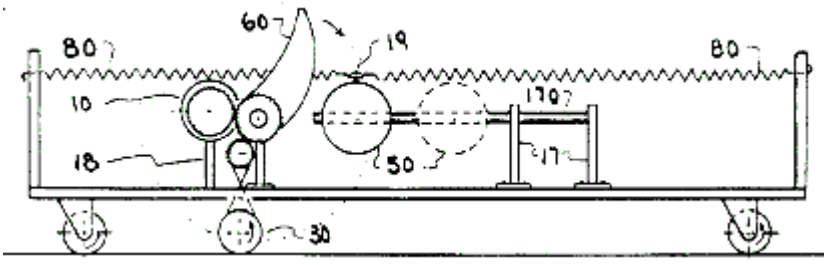
USP# 5,791,188 (8/11/98): Propulsion System
Howard, George J.



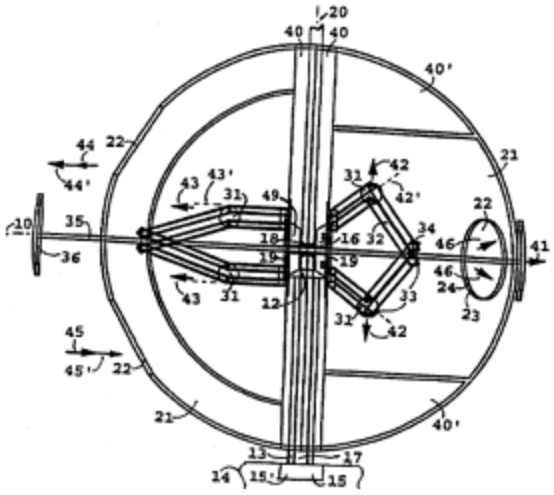
USP# 5,782,134 (7/21/98): Electromagnetically Actuated Thrust Generator
Bouden, James D.



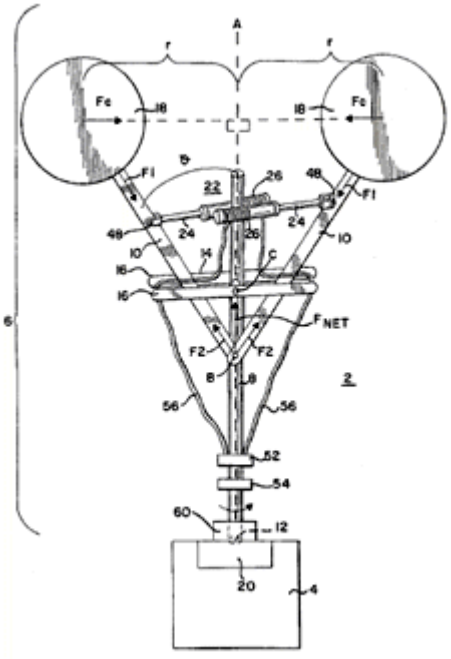
USP# 5,685,196 (11/11/97): Inertial Propulsion Plus Device & Engine
Foster, Richard E.:



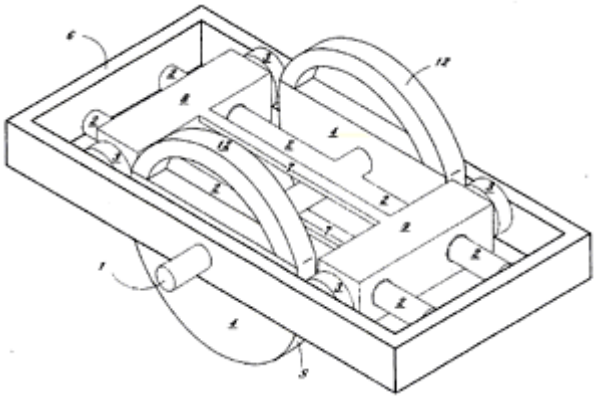
USP# 5,673,872 (10/7/97): Apparatus for Energy Transformation & Conservation
Shimshi, Ezra:



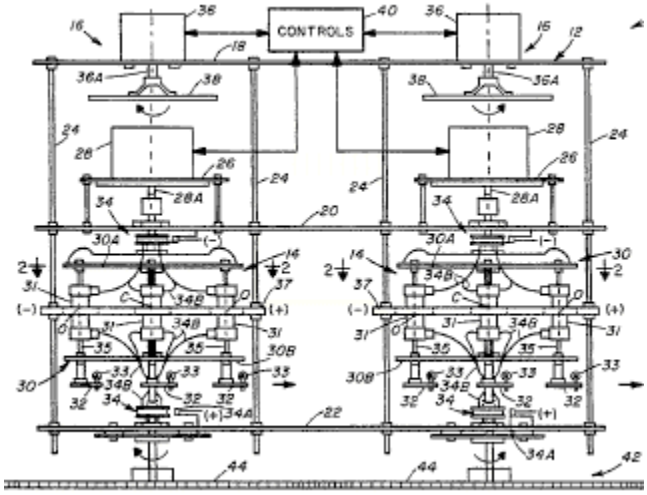
USP# 5,557,988 (9/24/96): Centripetally Impelled Vehicle
Claxton, John C.



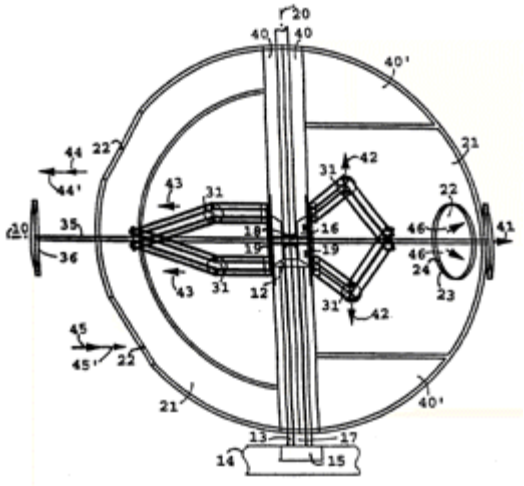
USP# 5,488,877 (2/6/96): Centrifugal Inertia Drive
Lieurance, Richard L.



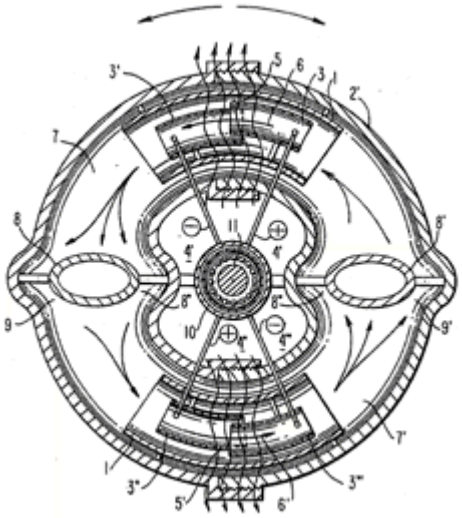
USP# 5,473,957 (12/12/95): Steerable Translational Force, &c.
Navarro, Thomas L.



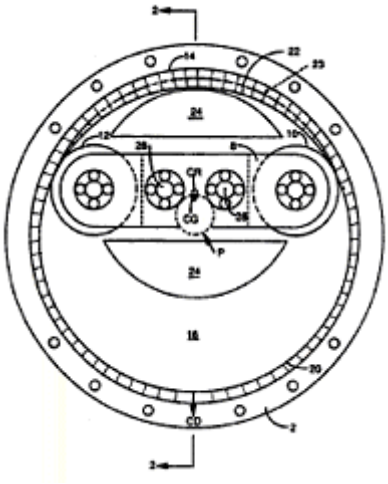
USP# 5,427,330 (6/27/95): Sphereroll
Shimshi, Ezra



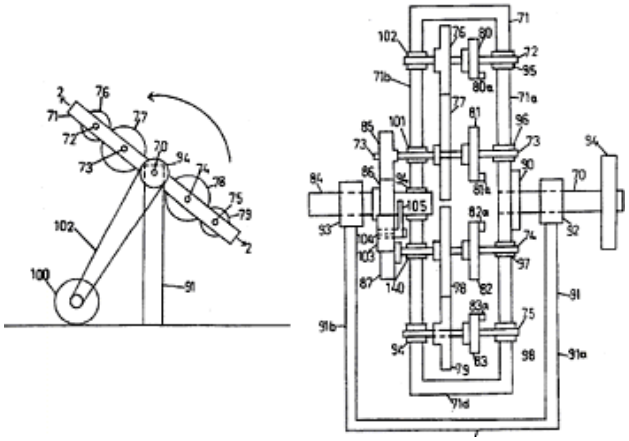
USP# 5,410,198 (4/25/95): Propulsion System
Butka, Kemal



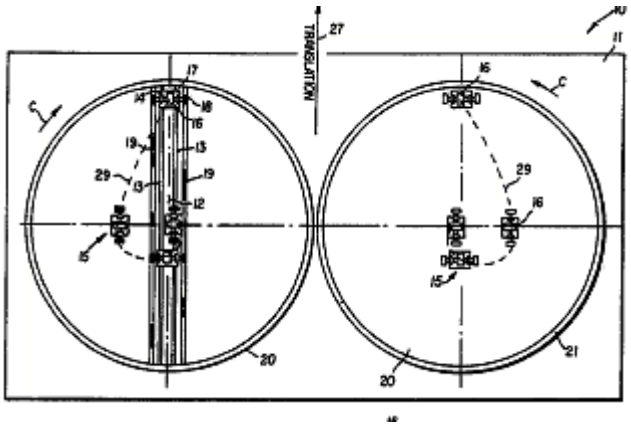
USP# 5,388,470 (2/14/95): Centrifugal Force Drive Machine
Marsh, Richard O., Jr.



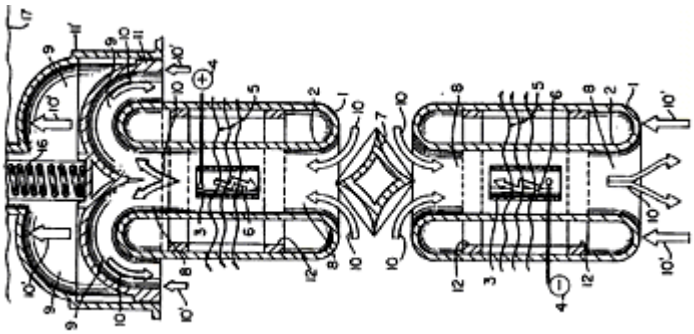
USP# 5,388,469 (2/14/95): Rotating Eccentric Weights Vibrator System
Woltering, Howard M.



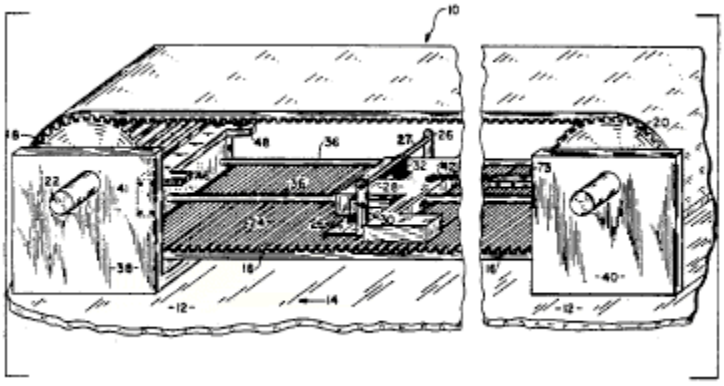
USP# 5,335,561 (8/9/94): Impulse Converter
Harvey, James



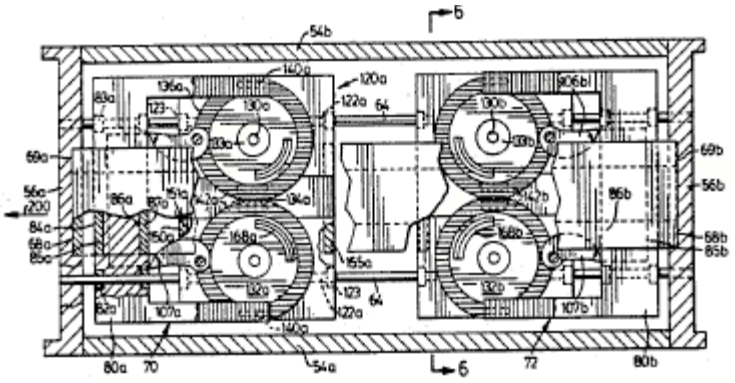
USP# 5,334,060 (8/2/94): Propulsion System
Butka, Kemal



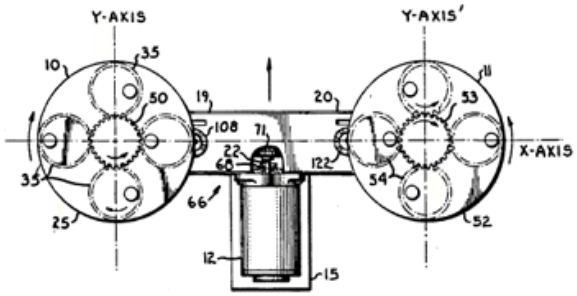
USP# 5,313,851 (5/24/94): Reusable Mass Propulsion System
Hull, Harold L & Joslin, Donald E.



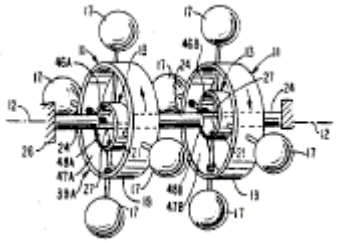
USP# 5,182,958 (2/2/93): Non-Linear Propulsion & Energy Conversion System
Black, James W.



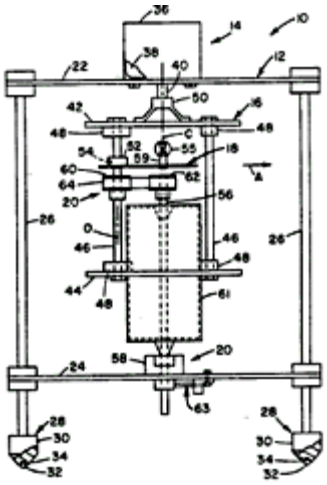
USP# 5,167,163 (12/1/92): Energy Transfer Device
McMahon, John C.



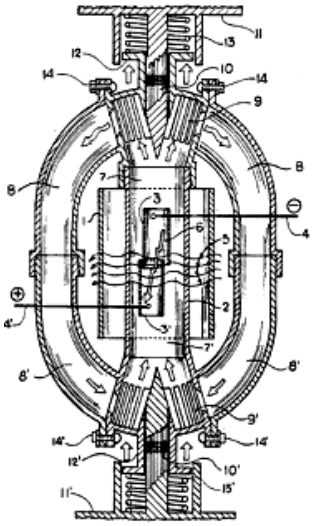
USP# 5,156,058: Converting Rotary Motion to Lineal Motion
Bristow, Theodore R., Jr.



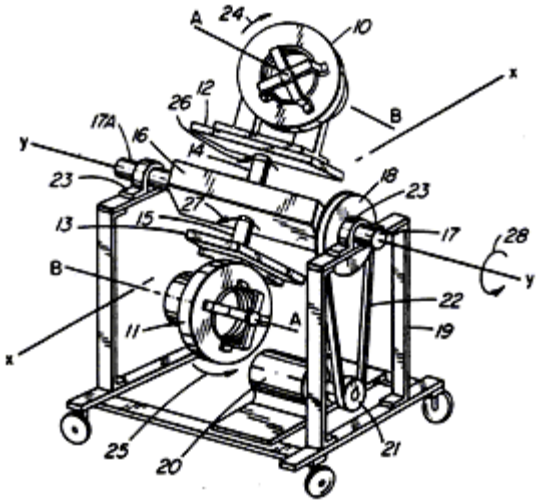
USP# 5,150,626 (9/29/92): Translational Force Generator
Isaacson, J. D. & Navarro, T. L.



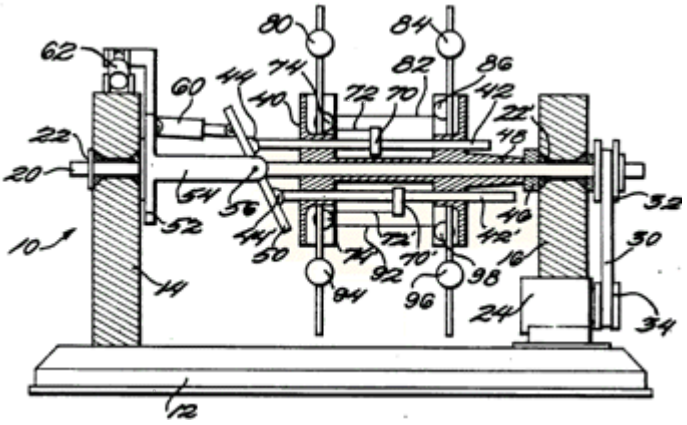
USP# 5,111,087 (5/5/92): Propulsion System
Butka, Kemal



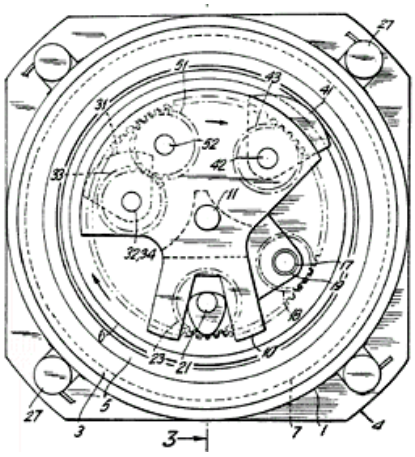
USP# 5,090,260 (2/25/92): Gyrostat Propulsion System
Delroy, M. S.& Delroy M.



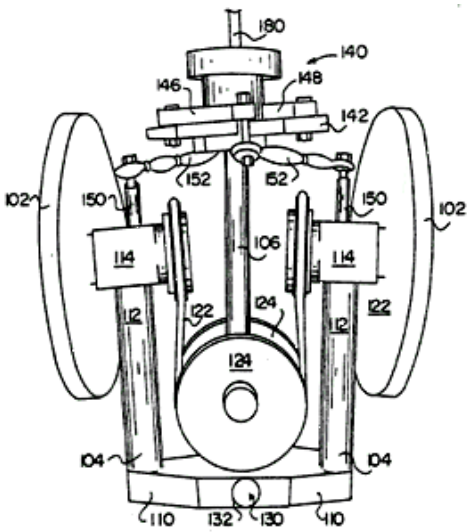
USP# 5,054,331 (10/8/91): Controllable Gyroscopic Propulsion Apparatus
Rodgers, A. T.



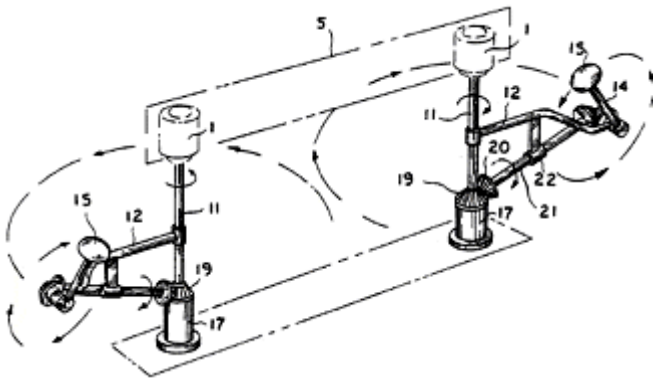
USP# 5,042,313 (8/27/91): Conversion of Rotational Output to Linear Force
Montalbano, Paul J.



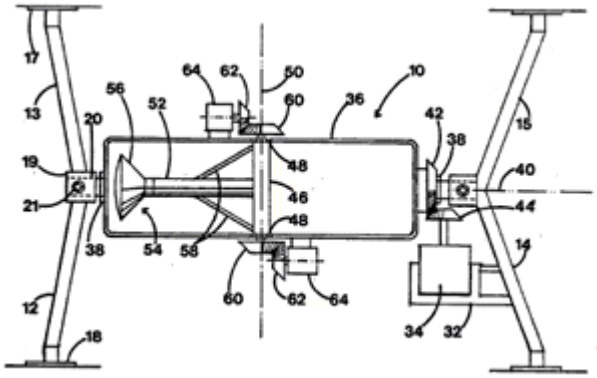
USP# 5,024,112 (6/18/91): Gyroscopic Apparatus
Kidd, Alexander D.



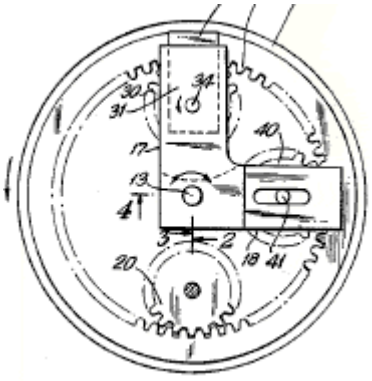
USP# 4,991,453 (2/12/91): Centripedal Device for Concentrating Centrifugal Force
Mason, Lyle M.



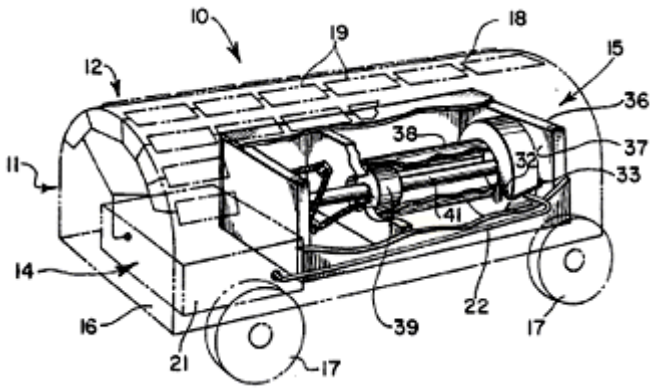
USP# 4,884,465 (12/5/89): Centripedal Device for Concentrating Centrifugal Force
Zachystal, George J.



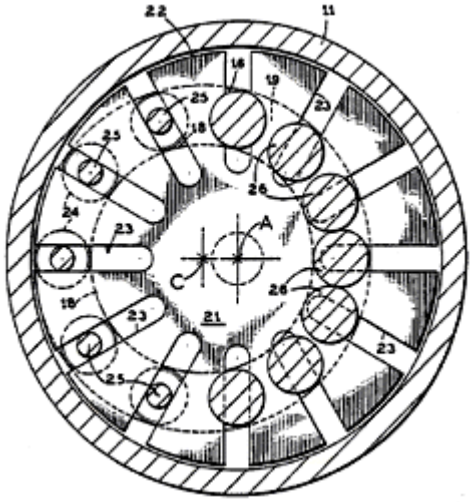
USP# 4,856,358 (8/15/89): Conversion of Rotational Output to Linear Force
Montalbano, Paul J.



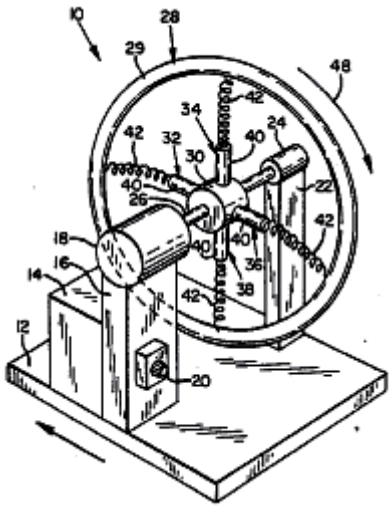
USP# 4,801,111 (1/31/89): System for Propulsion & Positioning
Rogers, Charles E., *et al.*



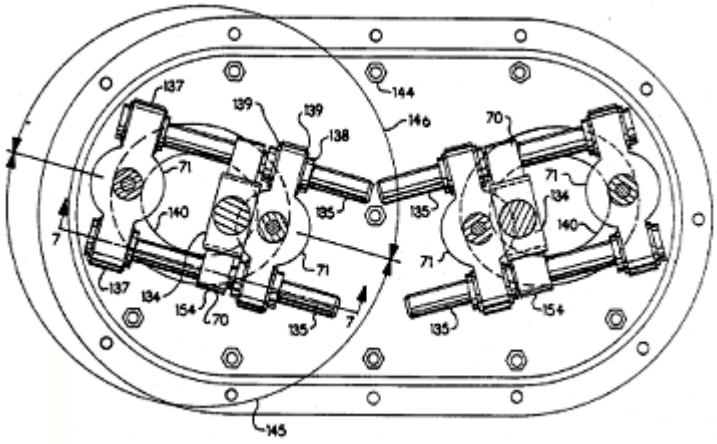
USP# 4,788,882 (12/6/88): Flywheel
Fulop, Charles



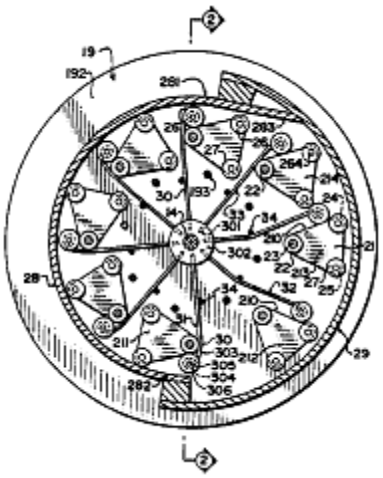
USP# 4,784,006 (11/15/88): Gyroscopic Propulsion Device
Kethley, Lancelot I.



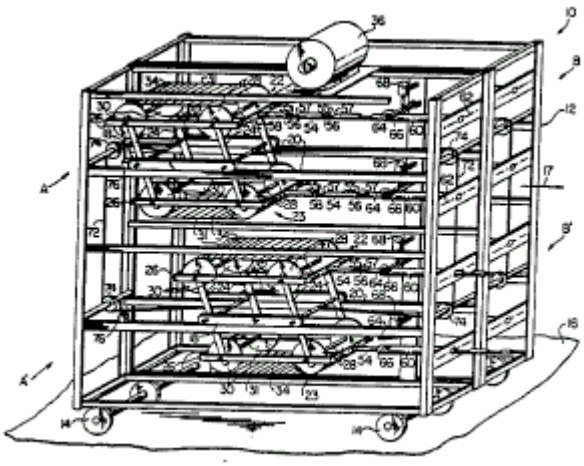
USP# 4,770,063 (9/13/88): Universal Propulsion Powerplant & Impulse Drive Unit
Mundo, James D.



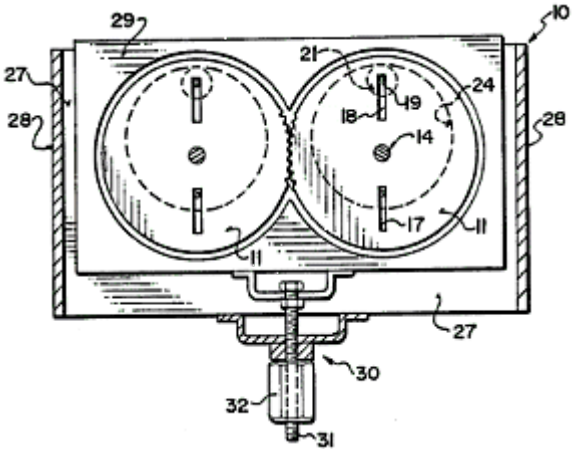
USP# 4,744,259 (5/17/88): Apparatus for Producing a Directional Unit Force
Peterson, Oscar F. A.



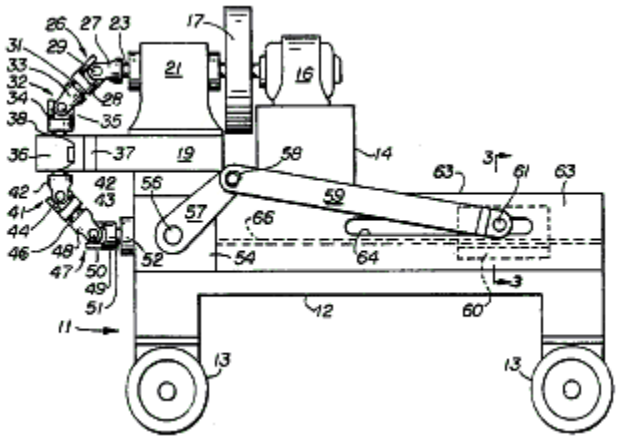
USP# 4,726,241 (2/23/88): Continuous Force & Impact Generator
Melnick, Harry S.



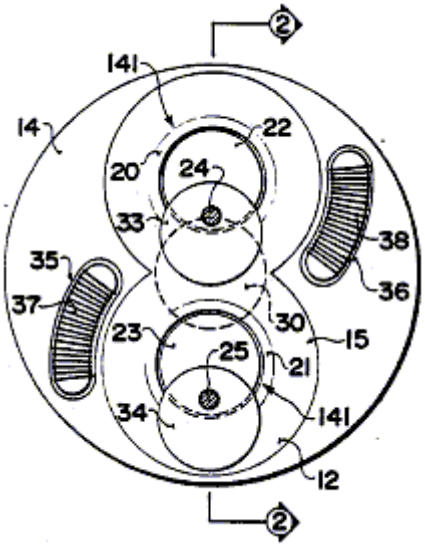
USP# 4,712,439 (12/15/87): Apparatus for Producing a Force
North, Henry



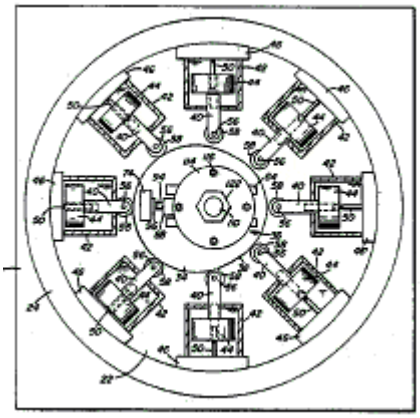
USP# 4,674,583 (6/23/87): Impulse Drive
Peppiatt, Alvin C., *et al.*



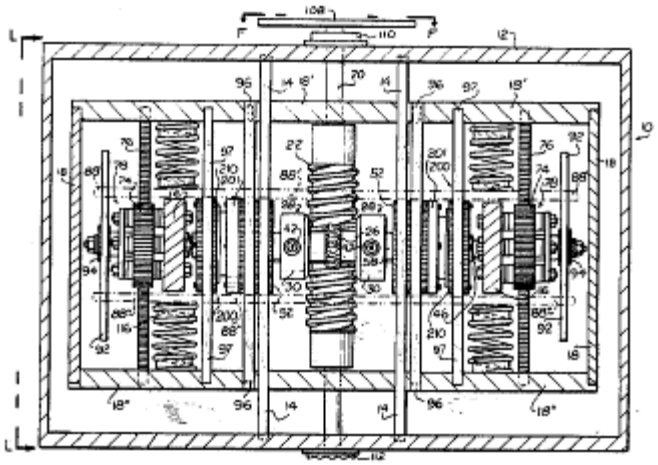
USP# 4,631,971 (12/30/86): Apparatus for Developing a Propulsive Force
Thornson, Brandson R.



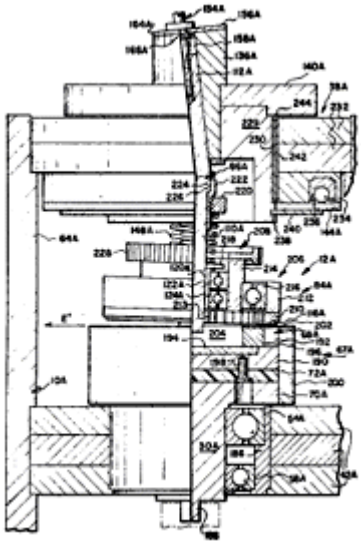
USP# 4,579,011 (3/1/86): Propulsion Apparatus
Dobos, Elmer M.



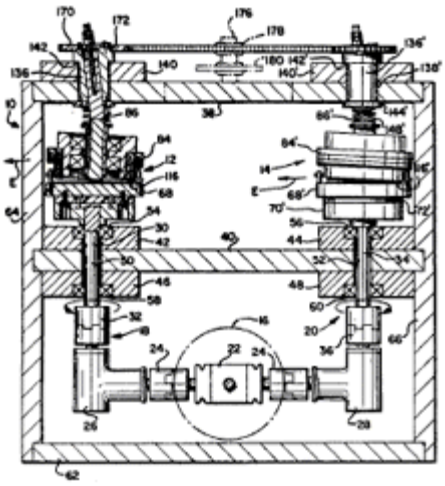
USP# 4,577,520 (3/25/86): Mechanical Propulsion System
Colla, Joseph



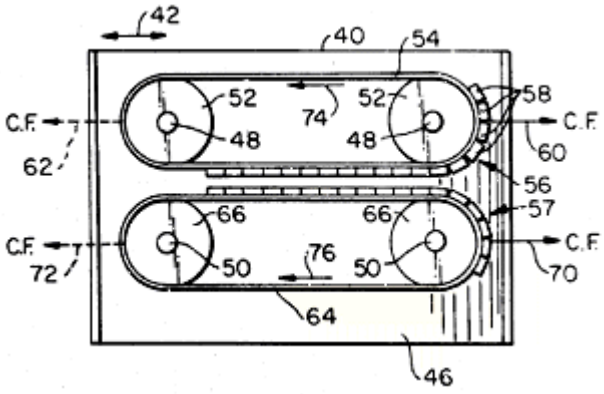
USP# 4,479,396 (10/30/84): Propulsion System
de Weaver, Fred, III



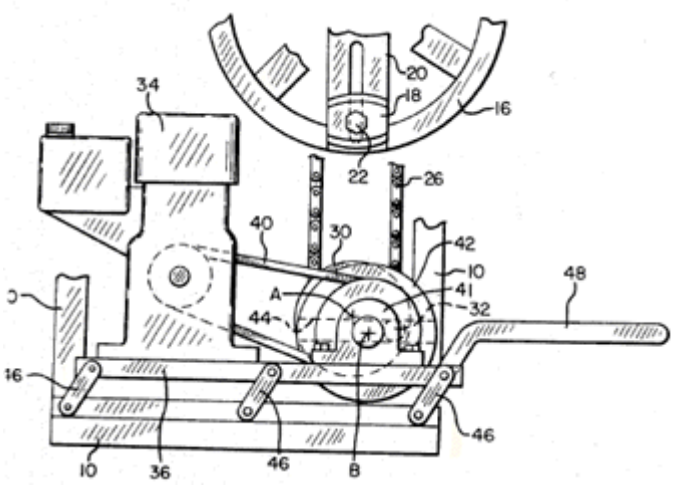
USP# 4,409,856 (10/18/83): Propulsion System
de Weaver, Fred, III:



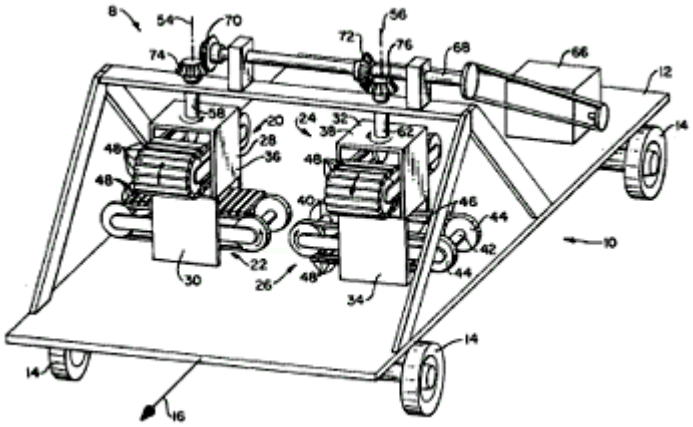
USP# 4,398,431 (8/16/83): Mechanical Power Transmitting System
Melnick, Harry S.



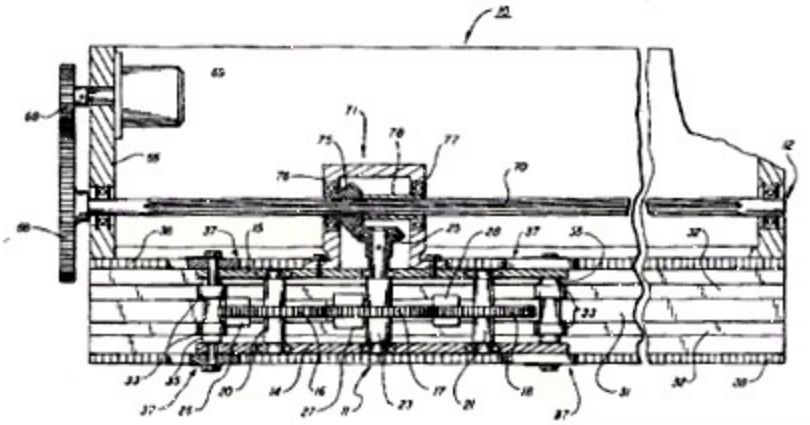
USP# 4,347,752 (9/7/82): Converting Rotary Motion to a Rectilinear Force
Dehen, Frederick L.



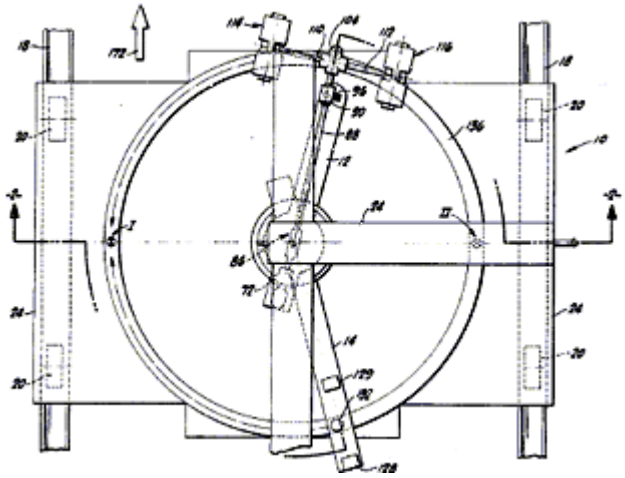
USP# 4,261,212 (4/14/81): Unidirectional Force Generator
Melnick, Harry S.



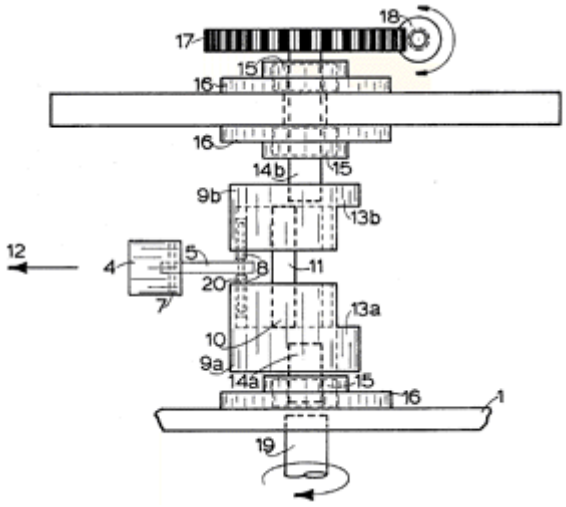
USP# 4,242,918 (1/6/81): Mechanical Propulsion System
Srogi, Ladislaw G.



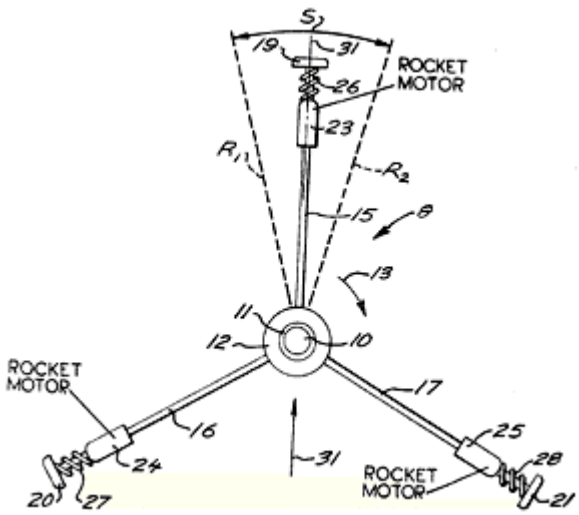
USP# 4,238,968 (12/16/80): Conversion of Centrifugal Force to Linear Force & Motion
Cook, Robert L.



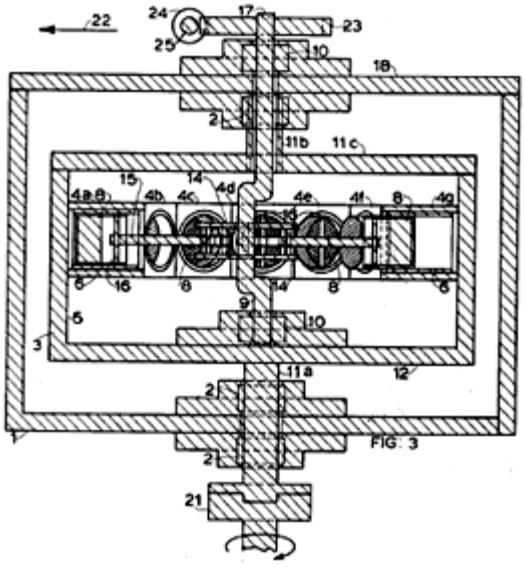
USP# 4,095,460 (6/20/78): Converting Rotary Motion into Unidirectional Motion
Cuff, Calvin I.



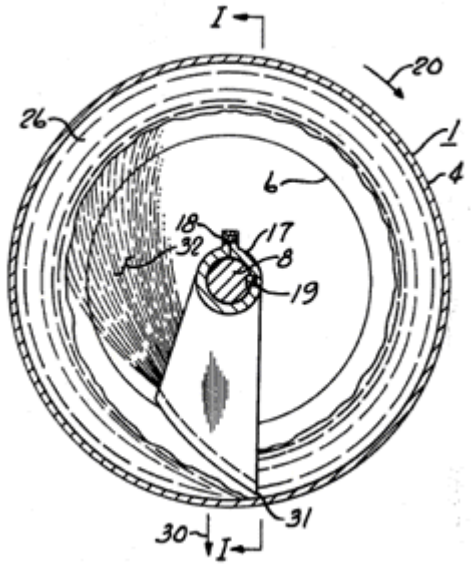
USP# 4,087,064 (5/2/78): Orbital Propulsion Apparatus
Knap, George



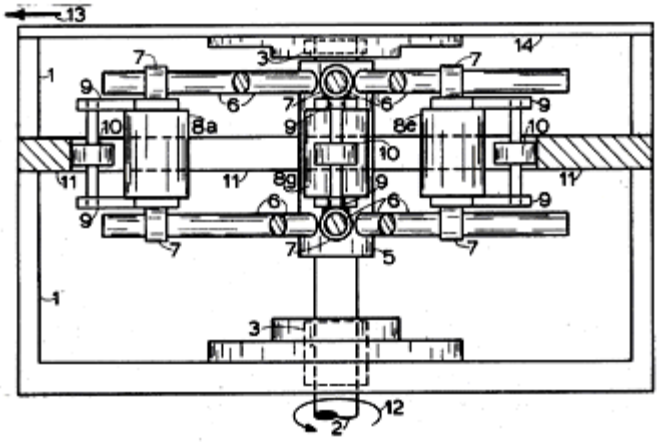
USP# 3,998,107 (12/21/76): Converting Rotary Motion into a Unidirectional Linear Motion
Cuff, Calvin I.



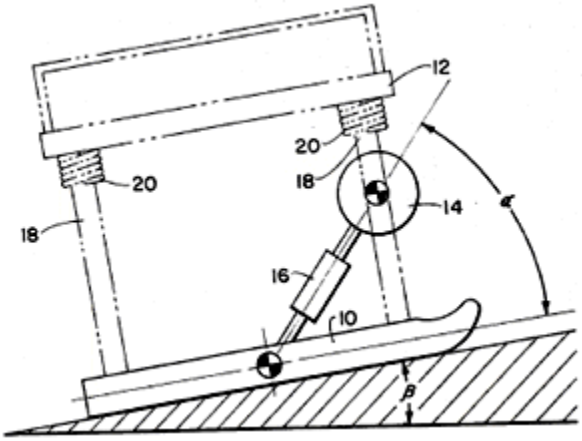
USP# 3,979,961 (9/14/76): Propelling an Object by an Unbalanced Centrifugal Force... Schnur, Nicholas J.



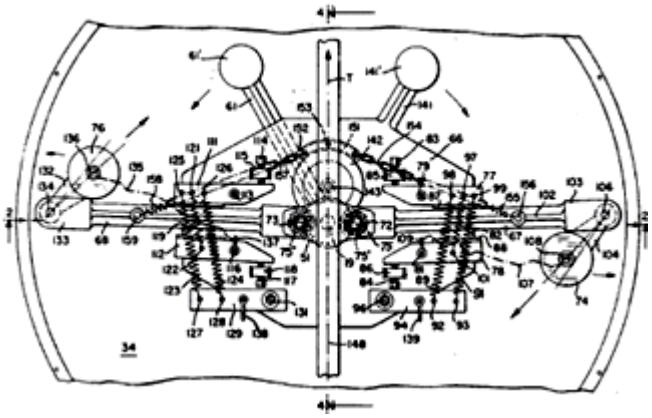
USP# 3,968,700 (7/13/76): Converting Rotary Motion into a Unidirectional Linear Motion Cuff, Calvin I.



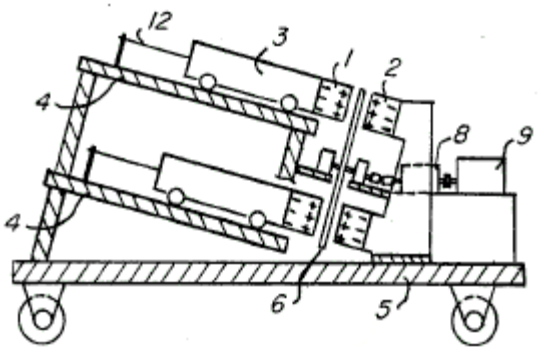
USP# 3,916,704 (11/4/75): Vibratory Motion
Gaberson, Howard A.



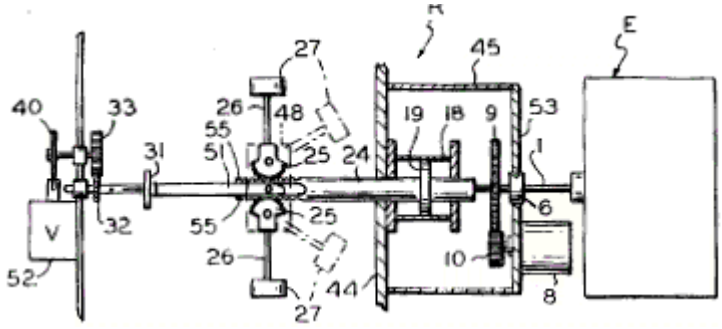
USP# 3,897,692 (8/5/75): Centrifugal Propulsion Drive & Steering Mechanism
Lehberger, Arthur N.



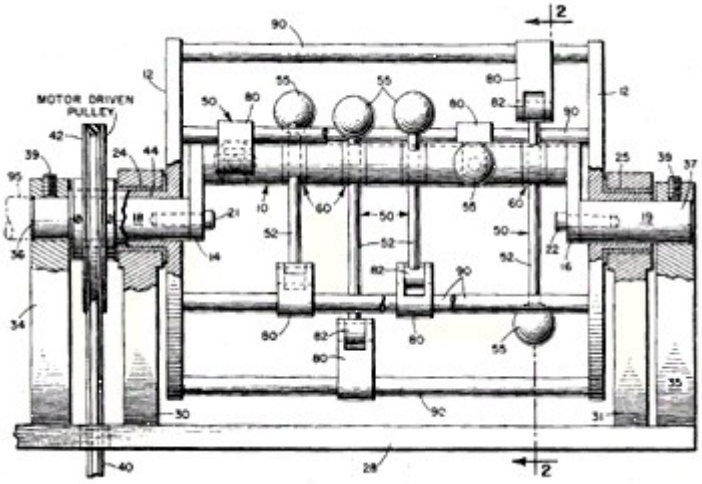
USP# 3,889,543 (6/17/75): Propulsion System
Mast, Oscar



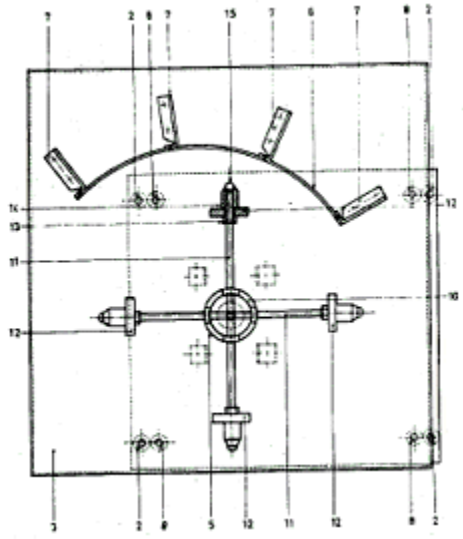
USP# 3,863,510 (2/4/75): Inertia Engine
Benson, Everett H.



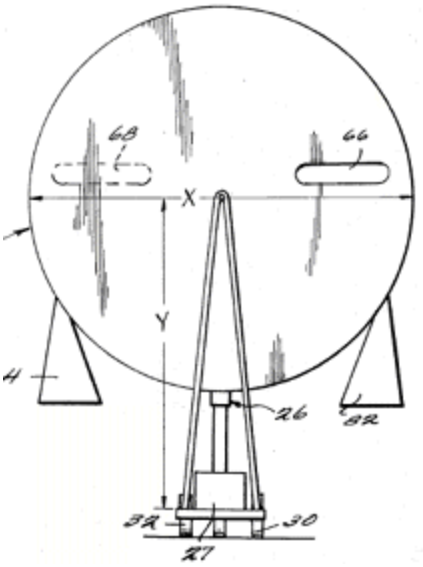
USP# 3,810,394 (5/14/74): Centrifugal Mechanical Device
Novak, Leo J.



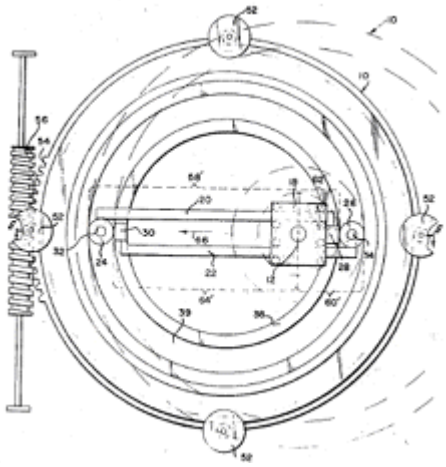
USP# 3,807,244 (4/30/74): Device for Transforming Kinetic Energy
Estrade, Fernand



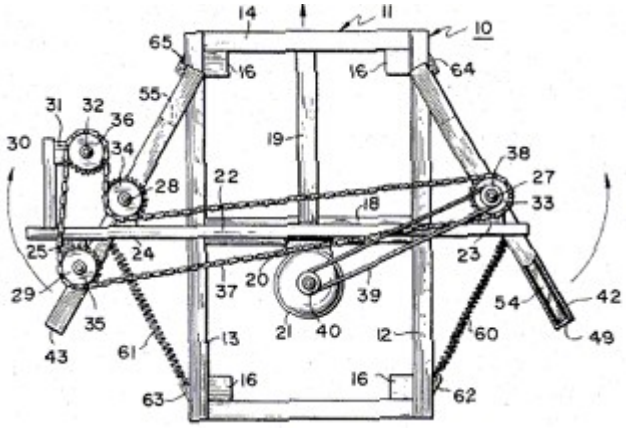
USP# 3,756,086 (9/4/73): Propulsion System
McAlister, Roy E., *et al.*



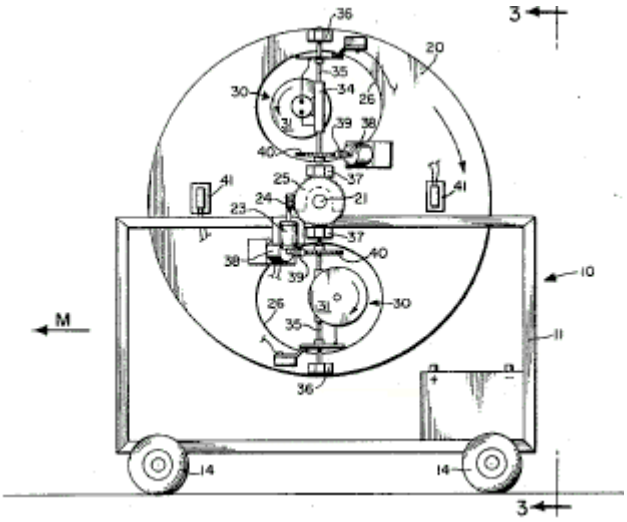
USP# 3,750,484 (8/7/73): Centrifugal Thrust Motor
Benjamin, Paul M.



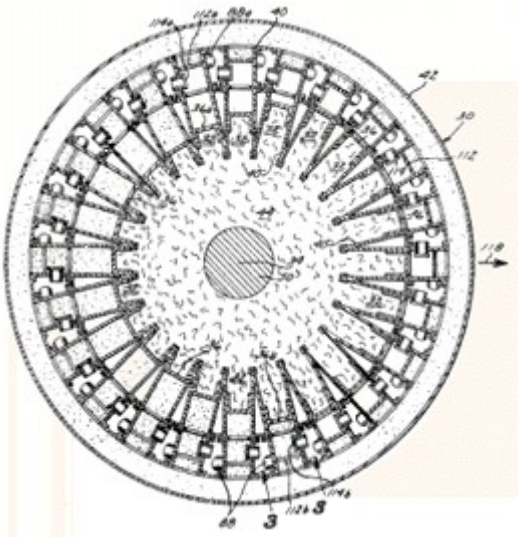
USP# 3,683,707 (8/15/72): Propulsion System
Cook, Robert L.



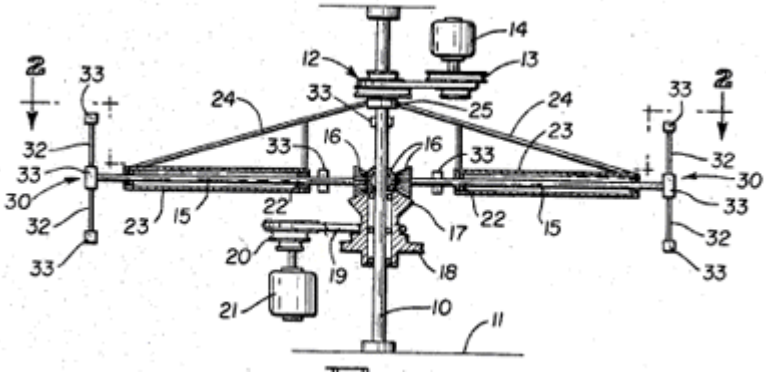
USP# 3,653,269 (4/4/72): Converting Rotary Motion into Unidirectional Motion
Foster, Richard E.



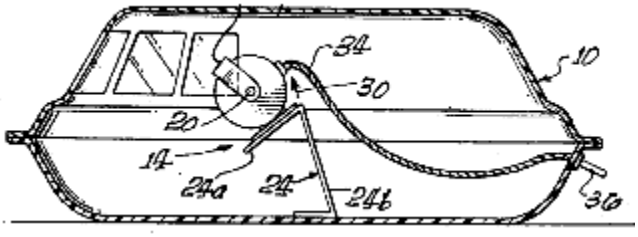
USP# 3,584,515 (6/15/71): Propulsion Apparatus
Matyas, Laszlo B.



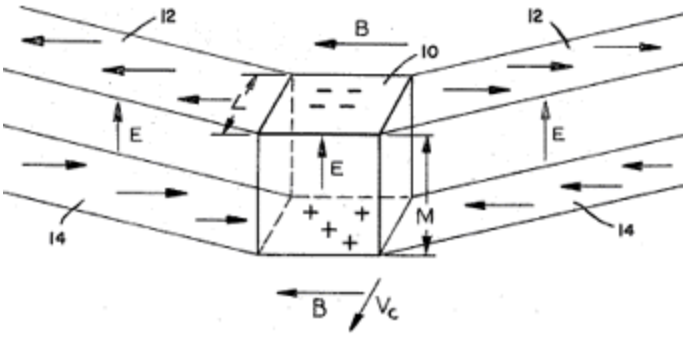
USP# 3,555,915 (1/19/71): Directional Force Generator
Young, Hersey W., Jr.



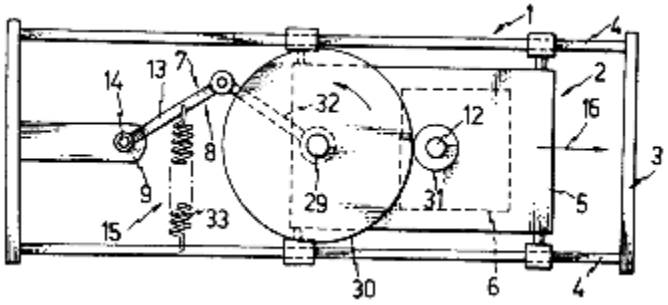
USP# 3,530,617 (9/29/70): Vibration Driven Vehicle
Halvorson, Earle M., *et al.*



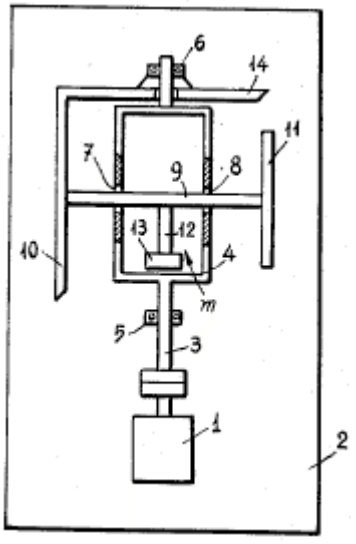
USP# 3,495,791 (2/17/70): Effecting Electro-Mechanical Energy Interchange...
Drell, Sidney D., *et al.*



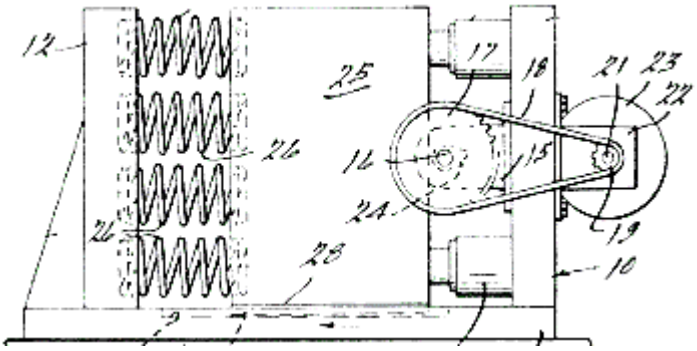
USP# 3,492,881 (2/3/70): Prime Mover
Auweele, Albert J. v.



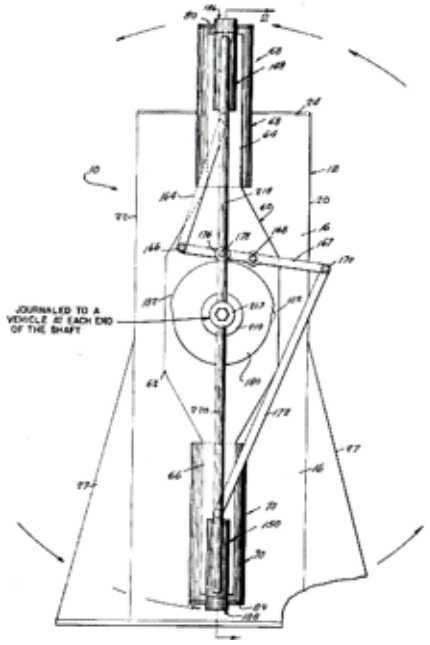
USP# 3,404,854 (10/8/68): Apparatus for Imparting Motion to a Body
di Bella, Alfio



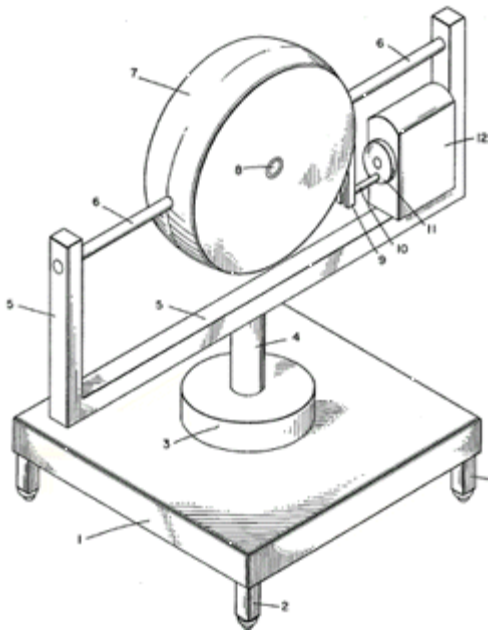
USP# 3,266,233 (8/16/66): Inertia Propulsion Device
Farrall, Arthur W.



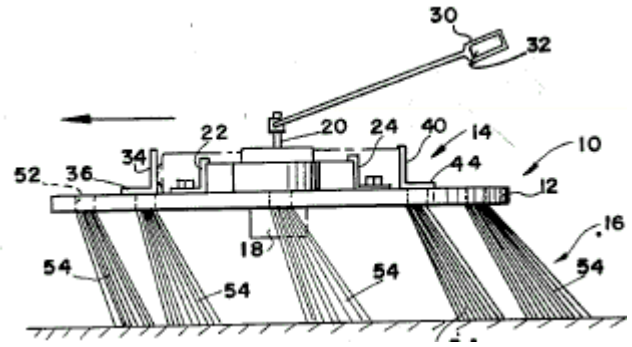
USP# 3,238,714 (3/8/66): Thrust Motor
Schur, George O.



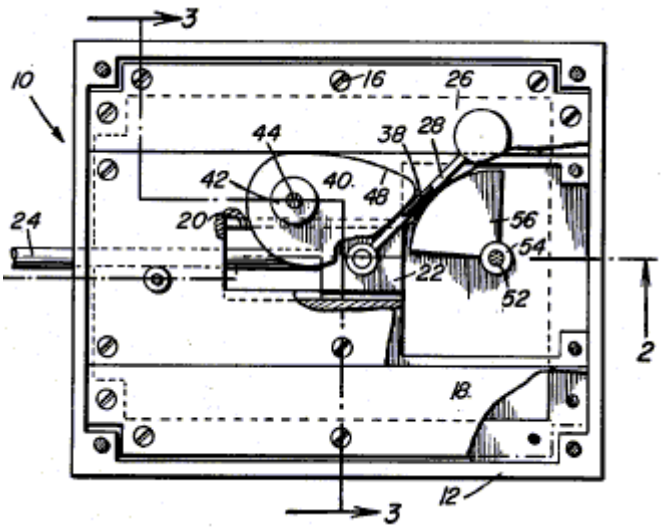
USP# 3,203,644 (8/31/65): Gyroscopic Inertial Space Drive
Kellogg, H. Dudley



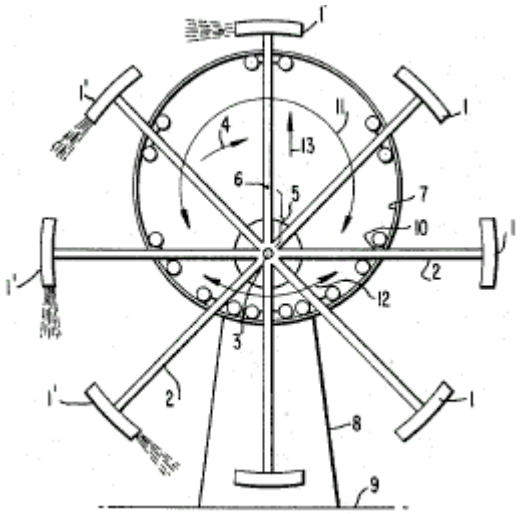
USP# 3,196,580 (7/27/65): Toy Vehicle Having... Self-Contained Drive Means
Rakestraw, Robert G.



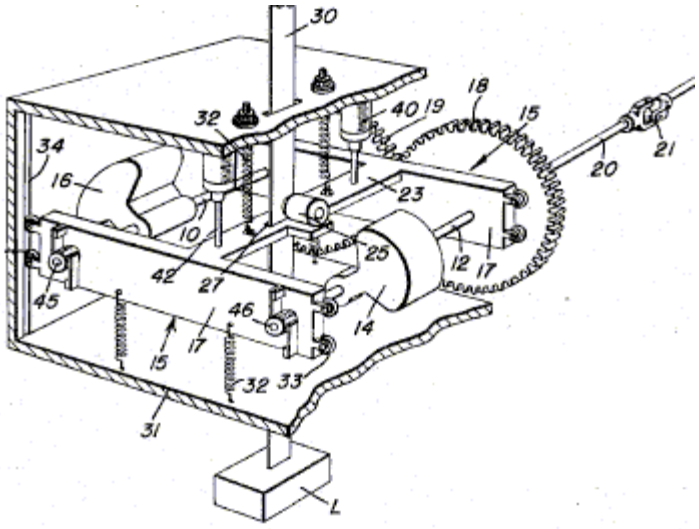
USP# 3,182,517 (5/11/65): Variable Oscillation System
Dean, Norman L.



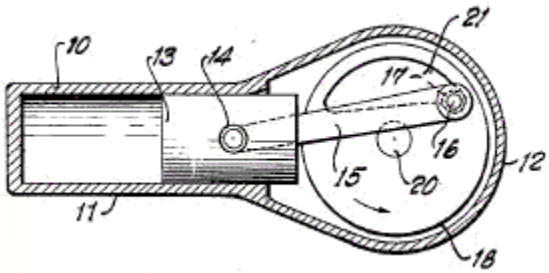
USP# 3,177,660 (4/13/65): Propulsion Apparatus
Haller, Paul



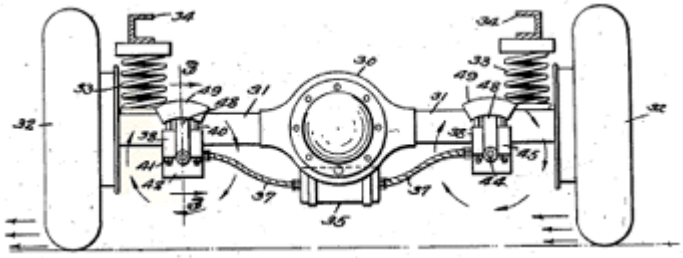
USP# 2,886,976 (5/19/59): System for Converting Rotary Motion into Unidirectional Motion
Dean, Norman L.



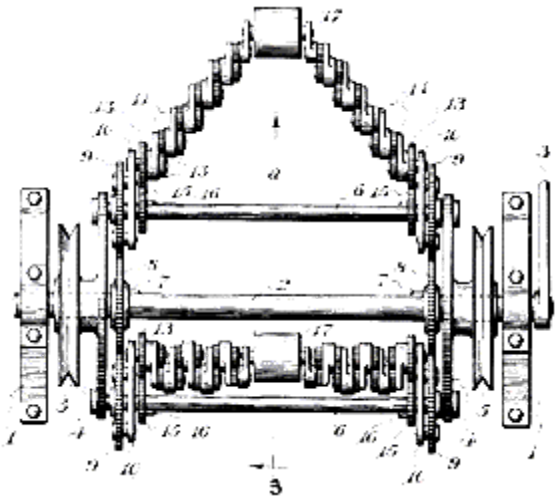
USP# 2,636,340 (4/28/53): Direct Push Propulsion Unit
Llamozas, Juan D. M.



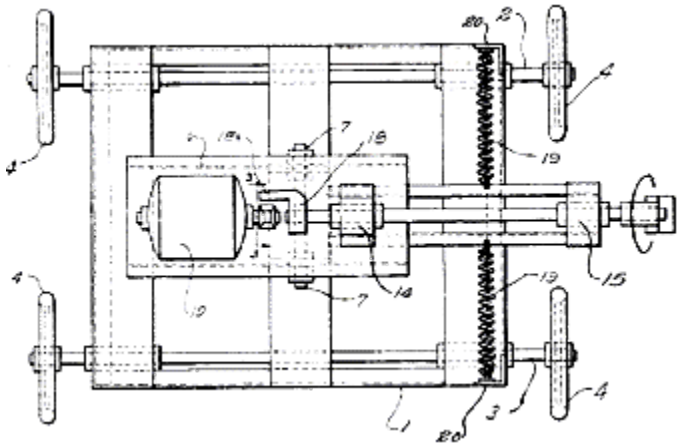
USP# 2,639,777 (5/26/53): Method & Device for Imparting Lateral Movement
Dull, Marshall L.



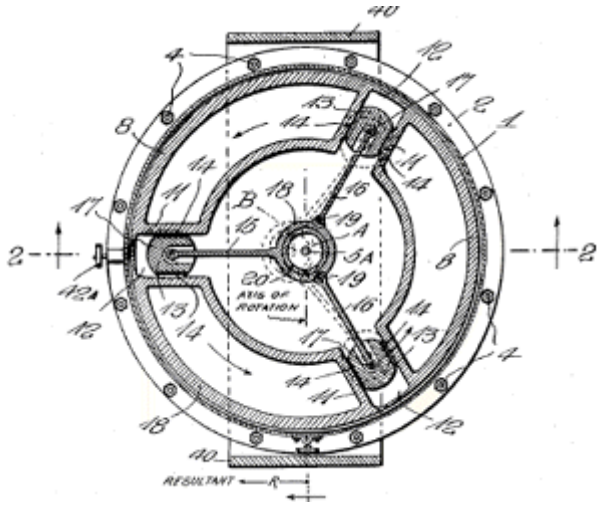
USP# 2,350,248 (5/30/44): Device for Obtaining Directional Force from Rotary Motion
Nowlin, Aubrey C.



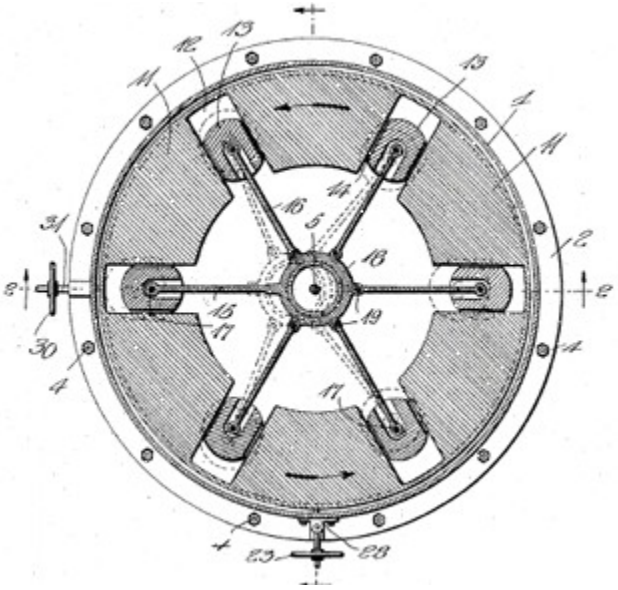
USP# 2,088,115 (7/27/37): Reaction Motor
Neff, Tom



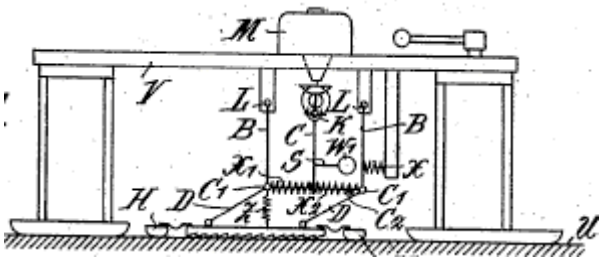
USP# 2,009,780 (7/30/35): Centrifugal Variable Thrust Mechanism
Laskowitz, Isidor B.



USP# 1,953,964 (4/10/34): Centrifugal Variable Thrust Mechanism
Laskowitz, Isidor B.



USP# 1,511,960 (10/14/24): Propulsion of Vehicles
Goldschmidt, Rudolf



Brandson THORNSON Inertial Engine

Brandson Thornson

Videos --

video.google.com/videoplay?docid=7426258106071720512
47 sec - Apr 14, 2006
This clip submitted by Dr. Gennady Shipov demonstrates the Thornson Inertial ... a canoe through a swimming pool during testing by ...

http://jnaudin.free.fr/videos/tiedemo1.ra (Requires Realplayer)

http://jnaudin.free.fr/videos/tiedemo2.ra

http://jnaudin.free.fr/videos/tiewater.ra

http://www.google.com/search?q=Thornson+inertial&hl=en&client=firefox-a&hs=9JP&sa=X&rls=org.mozilla:en-US:official&nfpr=1&prmd=v&source=univ&tbs=vid:1&tbo=u&ei=ZoSATPOVH4OKlwem5O3SDg&oi=video_result_group&ct=title&resnum=3&ved=0CCcQqwQwAg
Thornson Inertial Engine
59 sec - Jul 16, 2006

www.3gpdb.com/videoy.php?b=0V6ucLgOH8q&thornson-inertial.
Thornson Inertial Engine 3GP MP4 FLV MP3 Video Download
Jun 7, 2010 ... Thornson Inertial Engine 3GP MP4 FLV MP3 Video Download.

---

http://www.americanantigravity.com/articles/thornson-inertial-engine.html
4-14-2006

Thornson Inertial Engine

video.google.com/videoplay?docid=7426258106071720512

This clip submitted by Dr. Gennady Shipov demonstrates the Thornson Inertial Engine - an off-center rotator design shown propelling a canoo through a swimming pool during testing by Brandson R. Thornson. The Thornson drive is one of many mechanical-implementations inertial propulsion concepts, and this clip appears to support proponents claims about its workability...

In US Patent #4631971, inventor Brandson R. Thornson published schematics indicating that a force-balanced off-center rotator could produce a net-directional thrust without expelling reaction-mass -- a familiar concept investigated by a number of inventors, including Robert Cook, James E. Cox, and many others. Dr. Tom Valone described the Thornson test in detail with the comment, "In 1990, a 16 foot Grumman canoe and two passengers with a gross weight of 450 pounds demonstrated a low acceleration rate and propulsion of one mph after traveling 75 feet in a swimming pool. The 60 pound Thornson prototype was totally sealed inside a plywood case..."

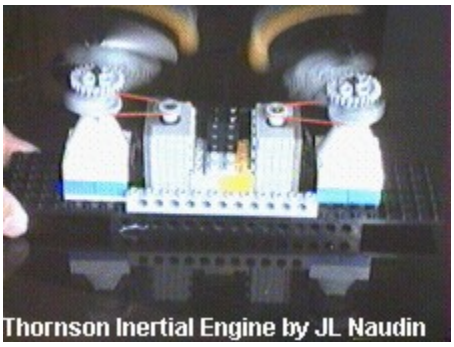
The scientific basis for inertial propulsion is generally attributed to Mach's Principle, which states that "the inertia of any system is the result of the interaction of that system and the rest of the universe". However, recent experimental research by Dr. James Woodward and colleagues has called into question the conventional wisdom that Mach's Principle can be tested using mechanical systems. In Woodward's view, the problem becomes an issue of phase-matching that is best solved by a conventional electromagnetic ineraction that serves as the basis for his "Mach-Lorentz Thruster" technology.

---

jnaudin.free.fr/html/TIE.htm
07-29-98

[*** Visit J.-L. Naudin's website -- Outstanding R&D]

Thornson Inertial Engine



The Thornson drive is composed of eccentric masses which, when rotated properly, causes a cancellation of all forces except in one direction.

The Thornson Inertial Engine (TIE) uses the force from a rotating inertial mass (the centrifugal force) for producing a linear impulse.

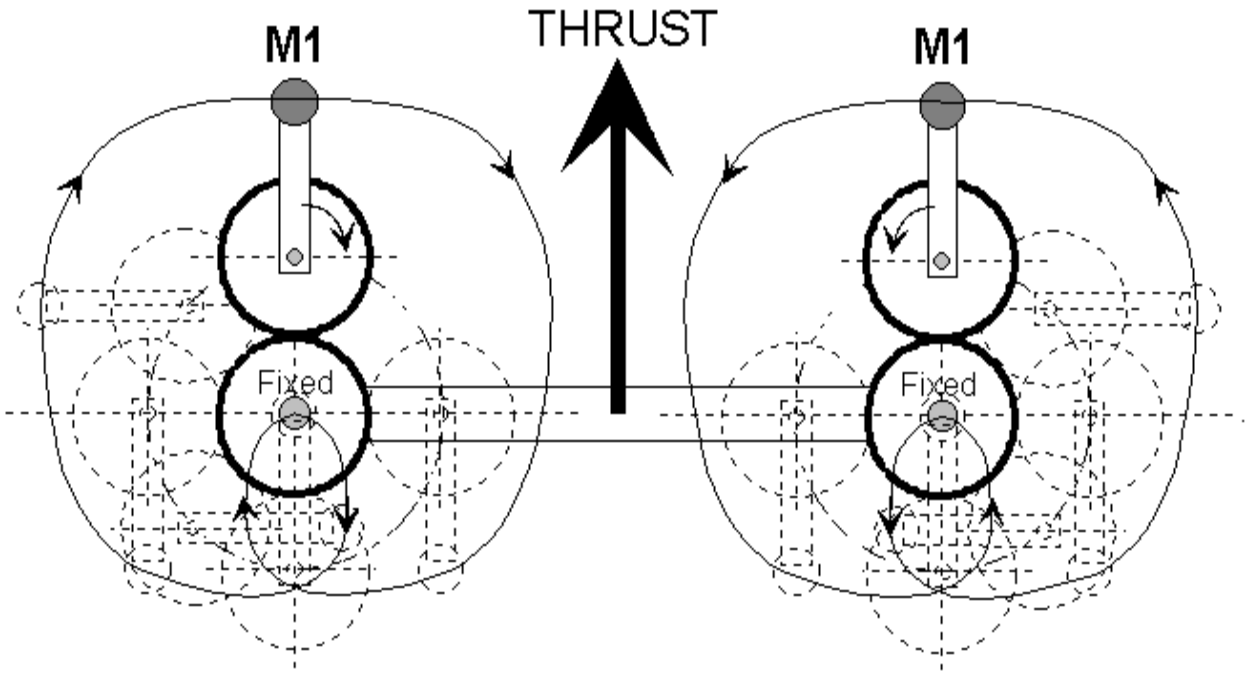
An inertial propulsion engine (IPE) is a mechanical device which uses a standard electrical motor drive for producing a motion.

Some tests and measurements conducted on Thornson Drive prototype have suggested that the IPE force-to-power ratio can be up to 2000% -- i.e., 20 times higher than a conventional jet engine. (see the document from Thomas Valone "Inertial propulsion: the Thornson EZKL drives" and also the document from the same author "Inertial Propulsion: Concept and Experiment")

Some detailed pictures about the TIE prototype. You may notice the four "slider" fixed on the base, for a successfull experiment, the TIE device must run on a clean and smooth surface like glasse.

The total weight of the TIE V1.0 is 220 gr. The two spinning masses have a very light weight M=1.5 g (each)

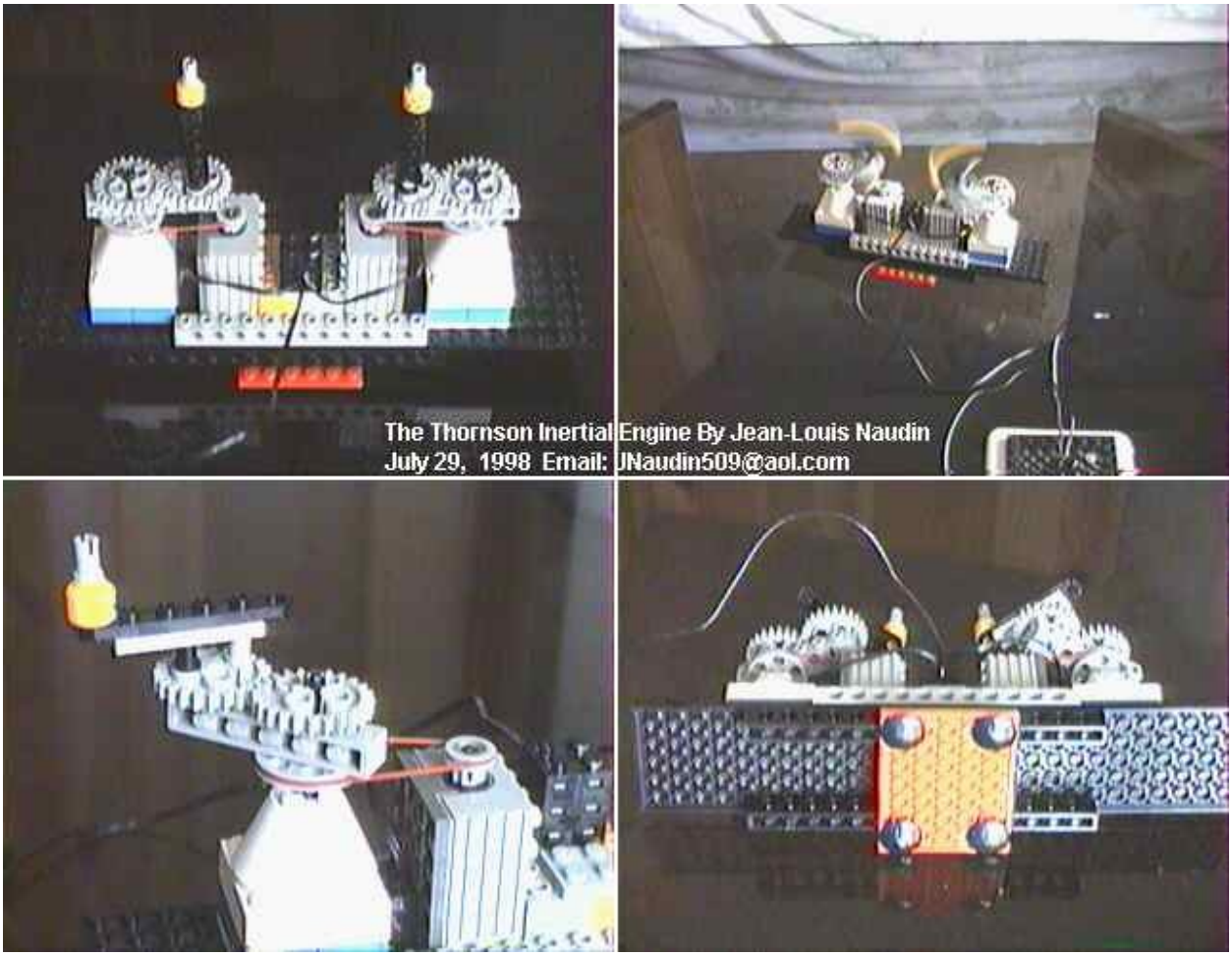
I have noticed that a high speed gives better results than heavy rotating masse, because the unidirectional trust is more constant and this reduces the jerky motion.



The Thornson Inertial Engine V1.0 by Jean-Louis Naudin
07-29-98 Email: JNaudin509@aol.com

Built with Legos !

The TIE v1.0 (Main parts for one drive) JL Naudin July 98



---

http://jnaudin.free.fr/html/TIEwater.htm

Thornson Inertial Engine -- Water Test

The Thornson Inertial Engine has been put in a plastic box with its own power supply so the TIE box was able to move freely on the surface of the water.

The weight of the TIE box with the power supply was 862 g.

The two spinning masses have a very light weight M=1.5 g (each)

I have noticed that a high speed gives better results than heavy rotating masse, because the unidirectional trust is more constant and this reduces the jerky motion.

The measured speed is about 24 meters per hour

This test seems also to confirm the fact that the Thornson Inertial Engine produces an unidirectional thrust.

In spite of the light rotating weights used (2x1.5 g), the TIE device is able to move itself on smooth surface (for the 220 g TIE slider version), and on water (for the 820 g TIE floating box version)...

Video : http://jnaudin.free.fr/videos/tiewater.ra

---

http://www.nottaughtinschools.com/Roy-Thornson%20/index.html

Video of Thornson presenting his device; includes schematics.

#0302 DVD: Thornson's Strange Physics (90 Mins)

$17.99

www.integrityresearchinstitute.org/.../ElectrograviticsElectrokineticsValone.pdf

US4631971 // EP0128008 // AT42993 // CA1222209 // JP60017272

Apparatus for Developing a Propulsion Force

Inventor: THORNSON BRANDSON R
EC: F03G3/00 IPC: F03G3/00; F03G7/00; F03G3/00; (+2)

Abstract -- A propulsion device comprises two symmetrical wheels mounted in the same plane for rotation about parallel axes at right angles to the plane and driven synchronously in opposite directions. Each wheel carries a pair of gearwheels which rotate around the axis of the wheel with the wheel and support eccentrically a pair of planet masses. The masses are arranged such that their distance from the axis of rotation of the wheel increases and decreases under control of the gearwheels. At a position immediately prior to the maximum distance of the planet from the axis, an electromagnetic device restrains outward movement of the planet mass so that when released the planet mass provides whip-like action inducing a resultant force in a direction at right angles to the plane containing the axes of the wheels.

Description

This invention relates to an apparatus for developing a propulsion force, which force can be used to propel the apparatus.

Propulsion of an object without contact with a relatively fixed body for example the ground or a planet surface is generally only obtained by movement of air or other gases in opposite direction to the movement of the object under the effect of jet or propellor systems. In the absence of a suitable atmosphere, for example in space, propulsion is generally obtained by rocket systems or by other systems which involve the projection of particles at high velocity from the object. Such systems of course require the consumption of fuel since the fuel must form the particles to be projected.

Attempts have been made for many years to develop a propulsion system which generates linear movement from a rotational drive. Examples of this type of arrangement are shown in a book entitled "The Death of Rocketry" published in 1980 by Joel Dickenson and Robert Cook.

However none of these arrangements has in any way proved satisfactory and if any propulsive effect has been obtained this has been limited to simple models.

It is one object of the present invention, therefore, to provide an improved propulsion system which obtains propulsive force in a resultant direction without the necessity for the opposite projection of particles.

Accordingly, the invention provides an apparatus for developing a propulsion force comprising

two symmetrical bodies, support means mounting the bodies for rotation about parallel spaced first axes and driving means for synchronously rotating the symmetrical bodies about the respective axes in opposite directions, each body including a pair of planet masses, means mounting each planet mass on the respective body, said mounting means being arranged such that the respective mass can freely rotate eccentrically about a second axis parallel to the first and such that the second axis rotates with the body about the first and moves radially relative to the first in timed relation to the rotation of the body so as to move during each cycle of rotation of the body from a position of minimum spacing to a position of maximum spacing and back to the position of minimum spacing from the first, and means for cyclically inhibiting and releasing rotation of the planet mass about the respective second axis so as to cause the planet mass to pivot inwardly relative to the first axis whereby said releasing causing a force outwardly of the first axis with the bodies arranged such that a reultant force from said forces lies at right angles to a plane adjoining the axes.

The inhibiting means preferably is arranged on the body for rotation therewith and uses electromagnetic forces to restrain the movement of the planet mass. In addition the positioning of the electromagnetic restraining device is such that the planet mass is released immediately prior to its position of maximum spacing from the first axis so that it provides a whip-like action while travelling at its maximum velocity.

The use of this basic technique can be incorporated into a vehicle propulsion system by providing four such bodies with the axes arranged at the corners of a rectangle so that by changing the body with which each body is associated in a pair from one adjacent body to another adjacent body forces in four different directions can be obtained. This effect can be further enhanced by mounting the bodies in pairs around the periphery of a circular support frame.

Preferably the bodies are in form of wheels or discs which support the planet masses and gearwheels for controlling the movement of the axes of the planet masses.

With the foregoing in view, and other advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, the invention is herein described by reference to the accompanying drawings forming a part hereof, which includes a description of the best mode known to the applicant and of the preferred typical embodiment of the principles of the present invention, in which:

DESCRIPTION OF THE DRAWINGS

In the drawings like characters of reference indicate corresponding parts in the different figures.

Examples of the apparatus will now be described in relation to the accompanying drawings in which:

FIG. 1 is a cross-sectional view along the lines 1--1 in FIG. 2 of one rotatable body or EZKL of an apparatus according to the invention in stationary position.

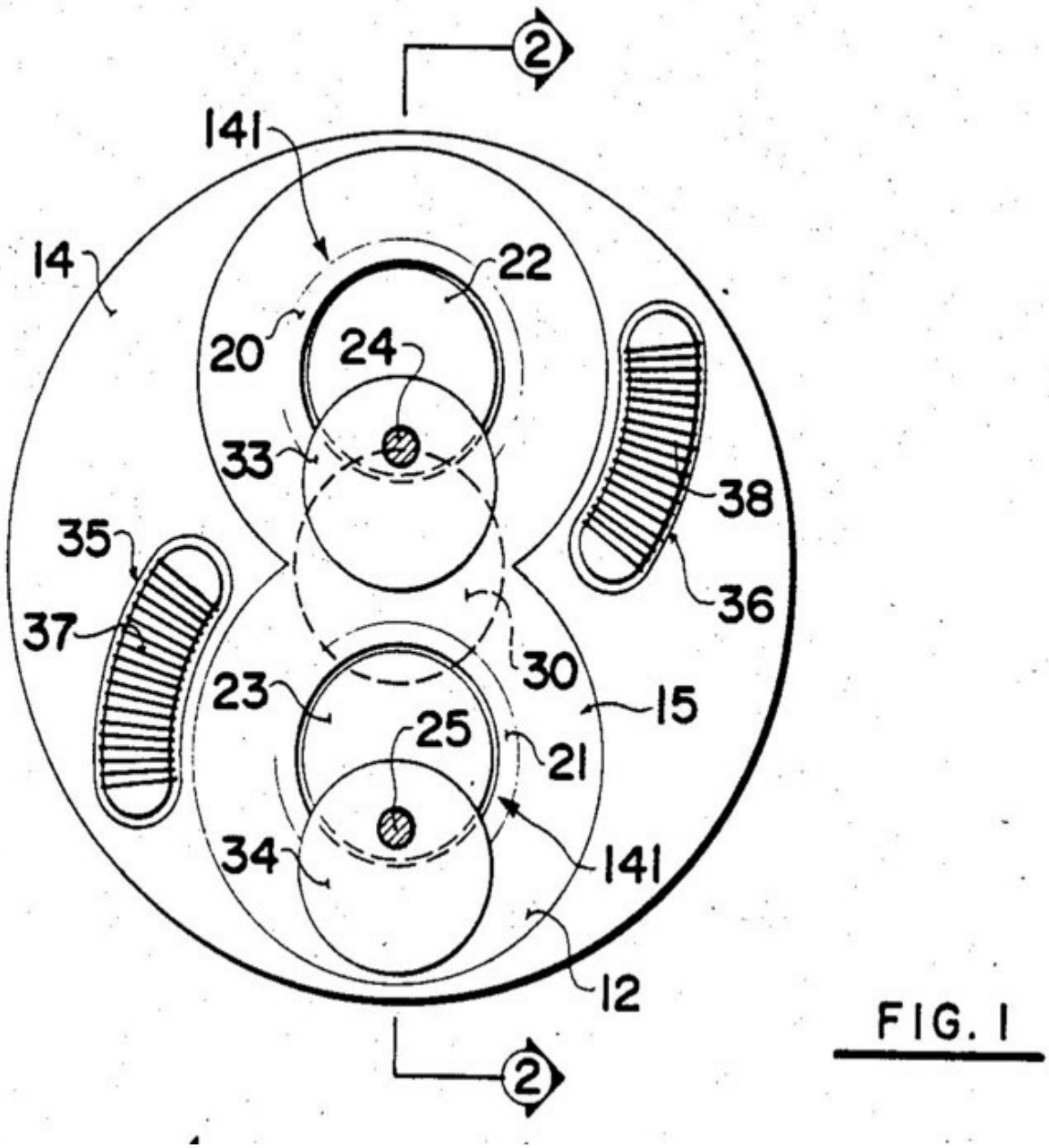


FIG. 1

FIG. 2 is a cross-section along the lines 2--2 of FIG. 1.

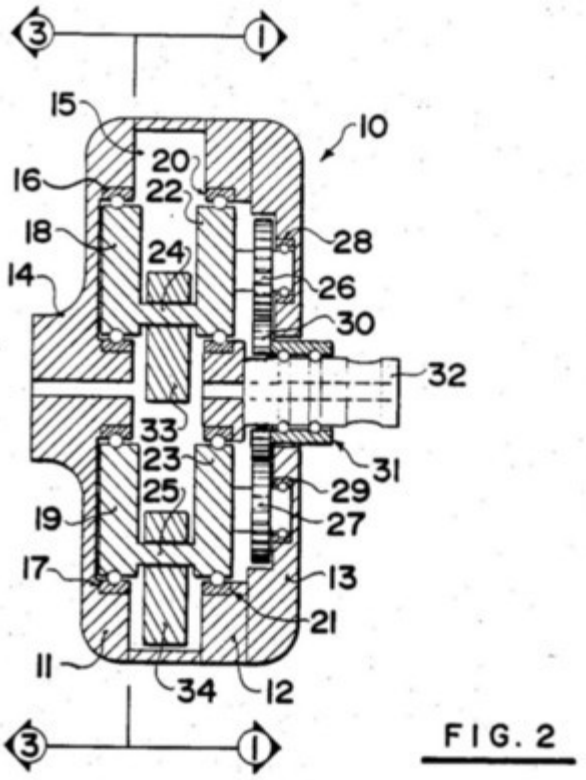


FIG. 2

FIG. 3 is a cross-section along the lines 3--3 of FIG. 2.

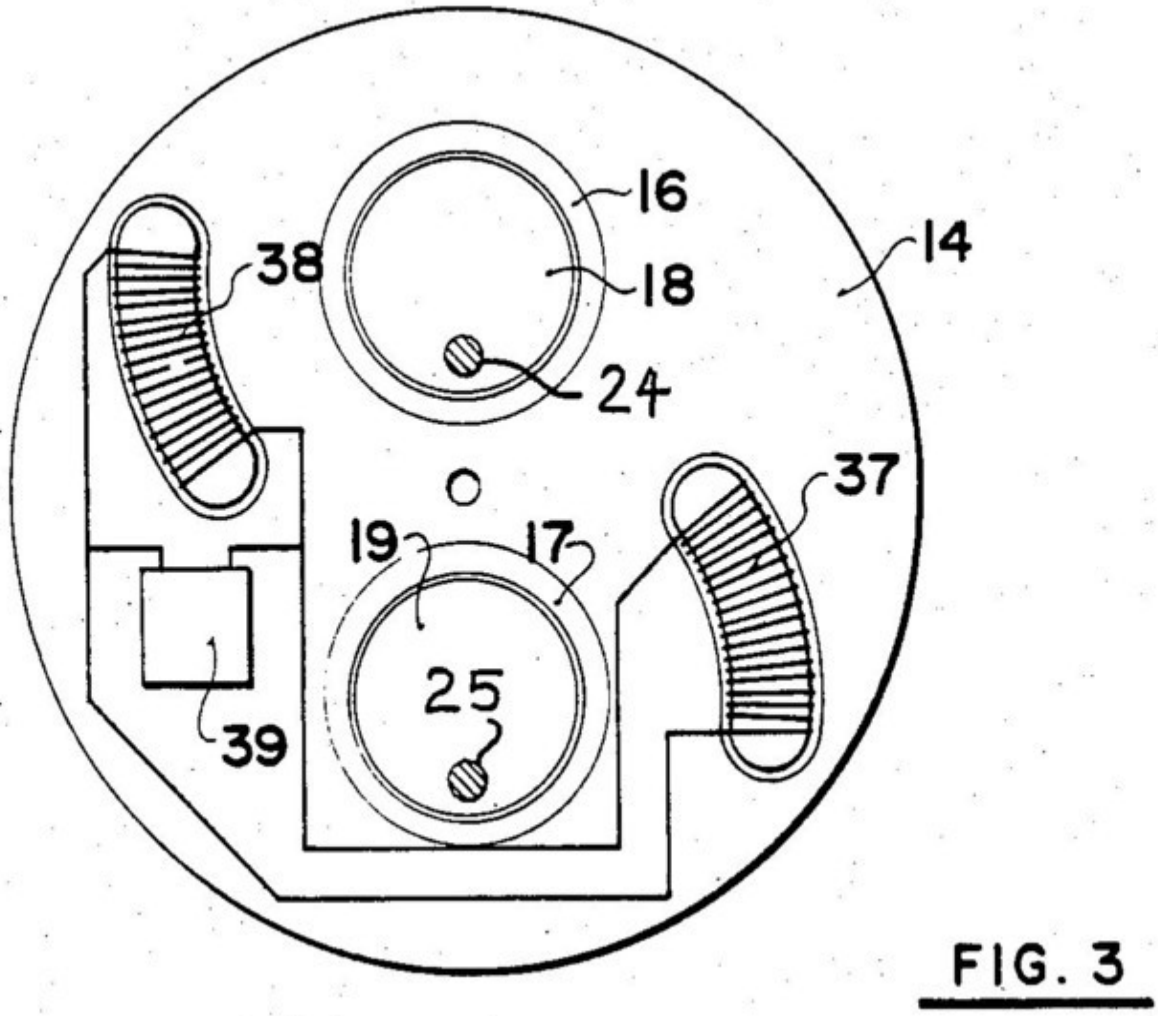


FIG. 3

FIG. 4 is a schematic illustration of the motion of one of the planet masses of FIGS. 1, 2 and 3.

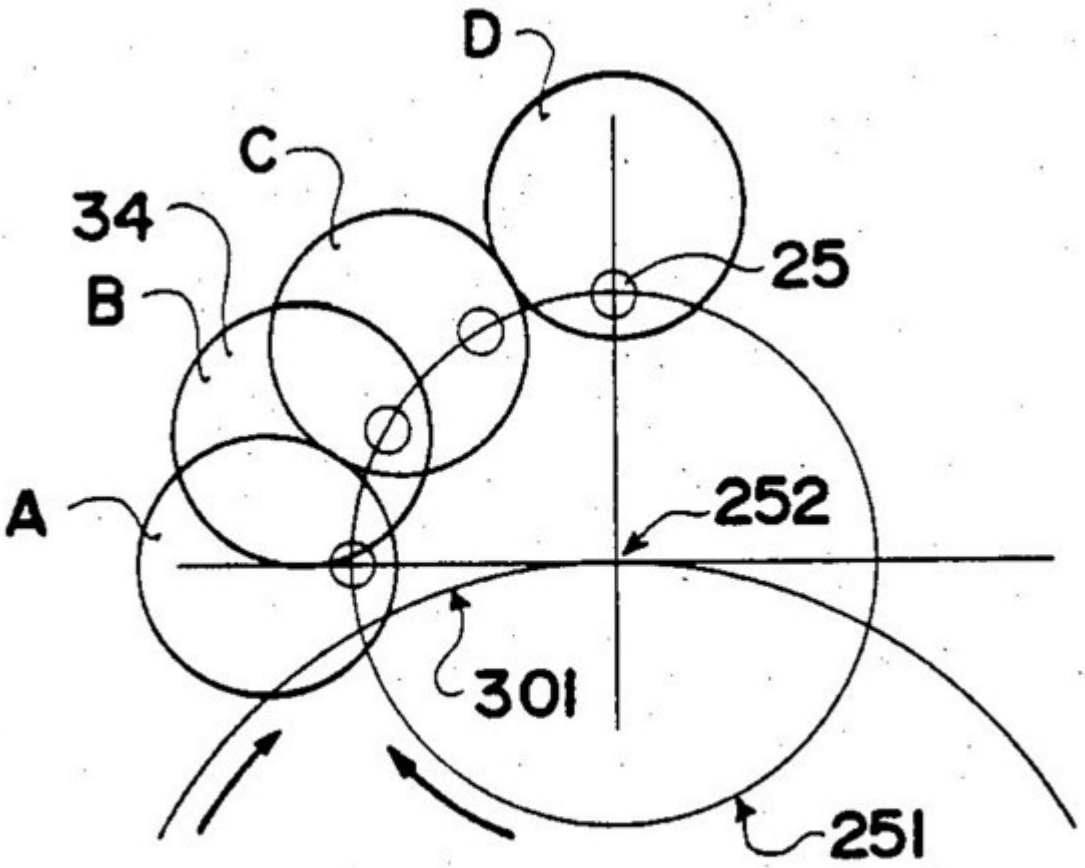


FIG. 4

FIG. 5 is a further schematic representation of the motion of the planet mass of FIG. 4.

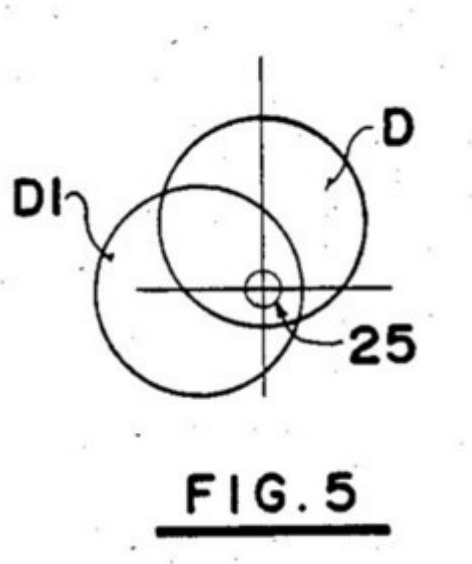


FIG. 5

FIG. 6 is a schematic illustration of the path of movement the planet masses of an apparatus incorporating four such bodies.

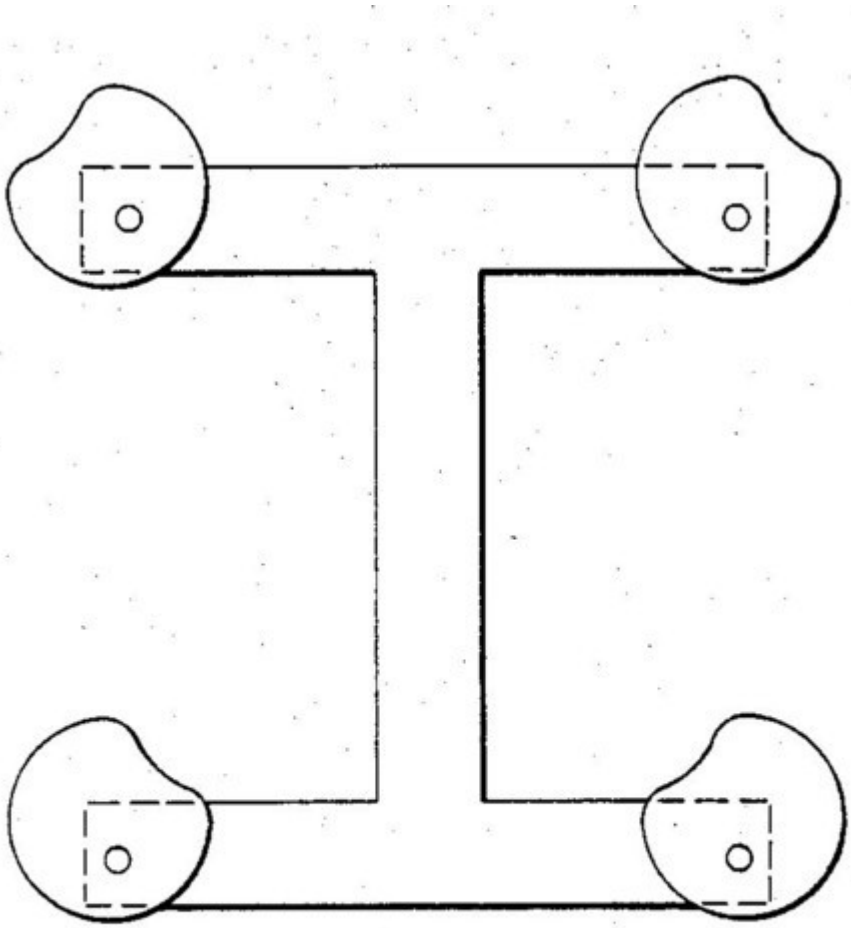


FIG. 6

FIG. 7 is a cross-sectional view along the lines 1--1 of FIG. 2 showing two bodies associated into a complete apparatus according to the invention.

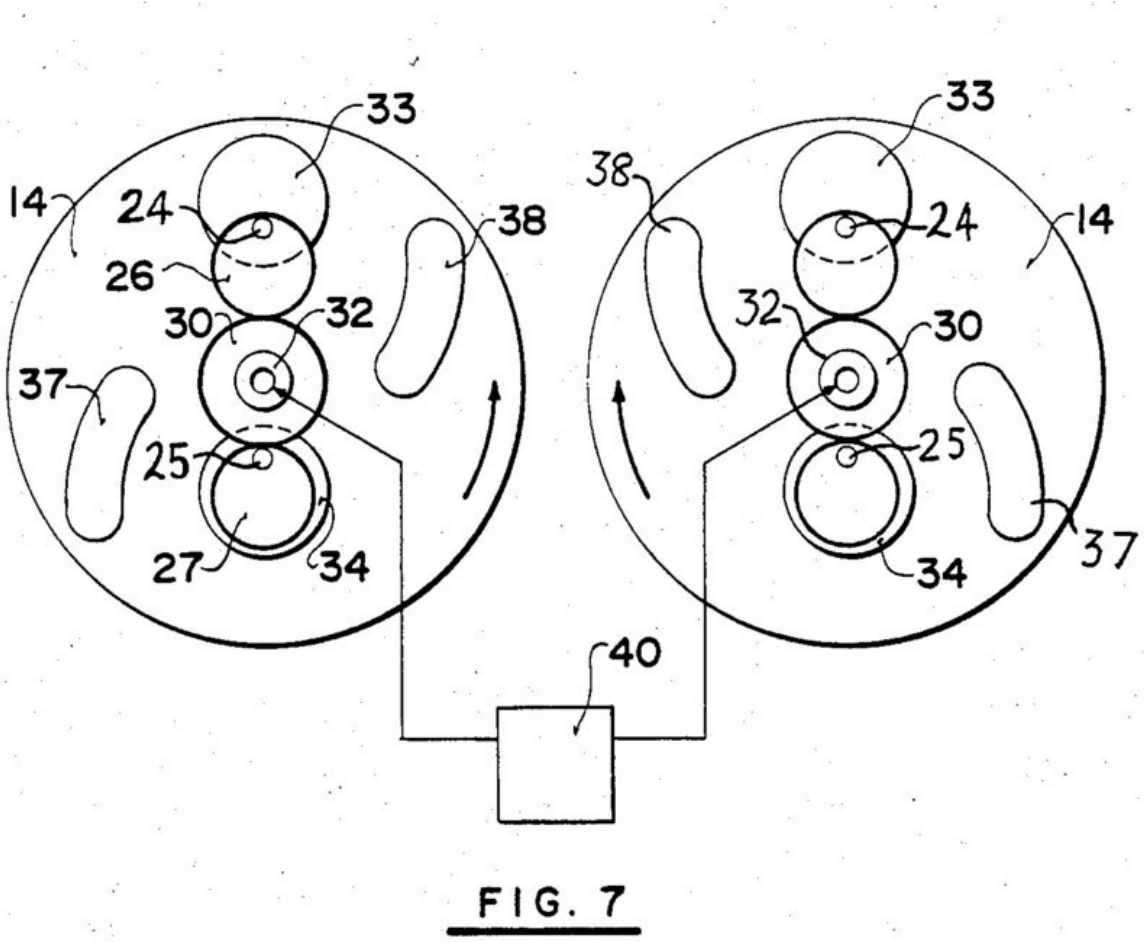


FIG. 7

FIG. 8 is a schematic plan view of an apparatus providing a complete propulsion system for a vehicle.

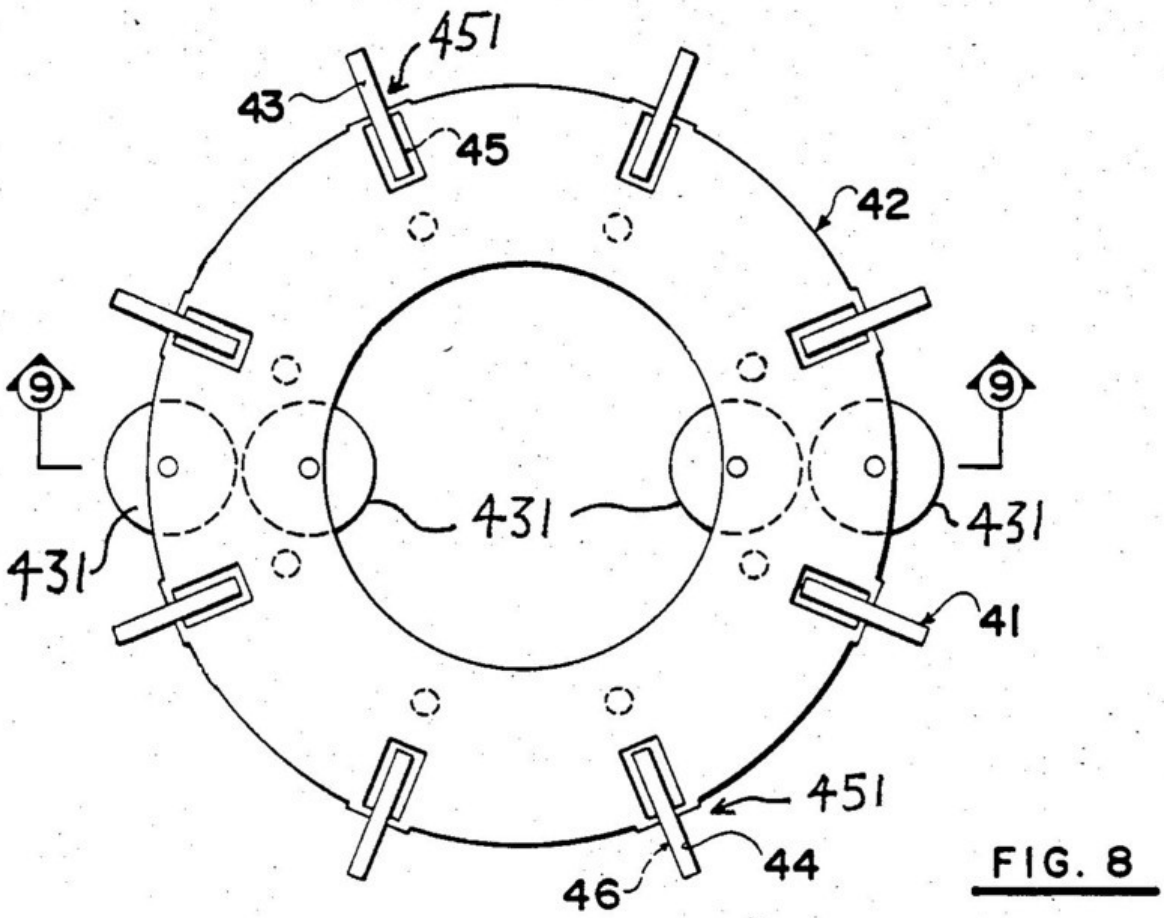


FIG. 8

FIG. 9 is a schematic side elevational view of the propulsion system of FIG. 8.

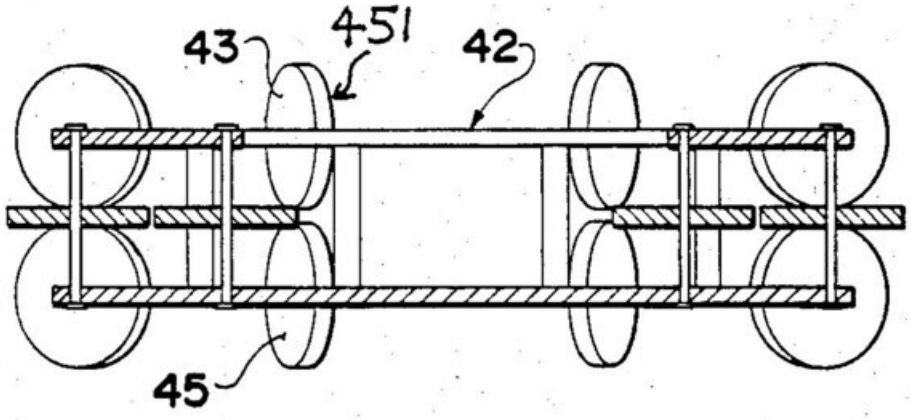


FIG. 9

FIG. 10 is a cross-sectional view similar to FIG. 1 of a modified arrangement of one body or EZKL.

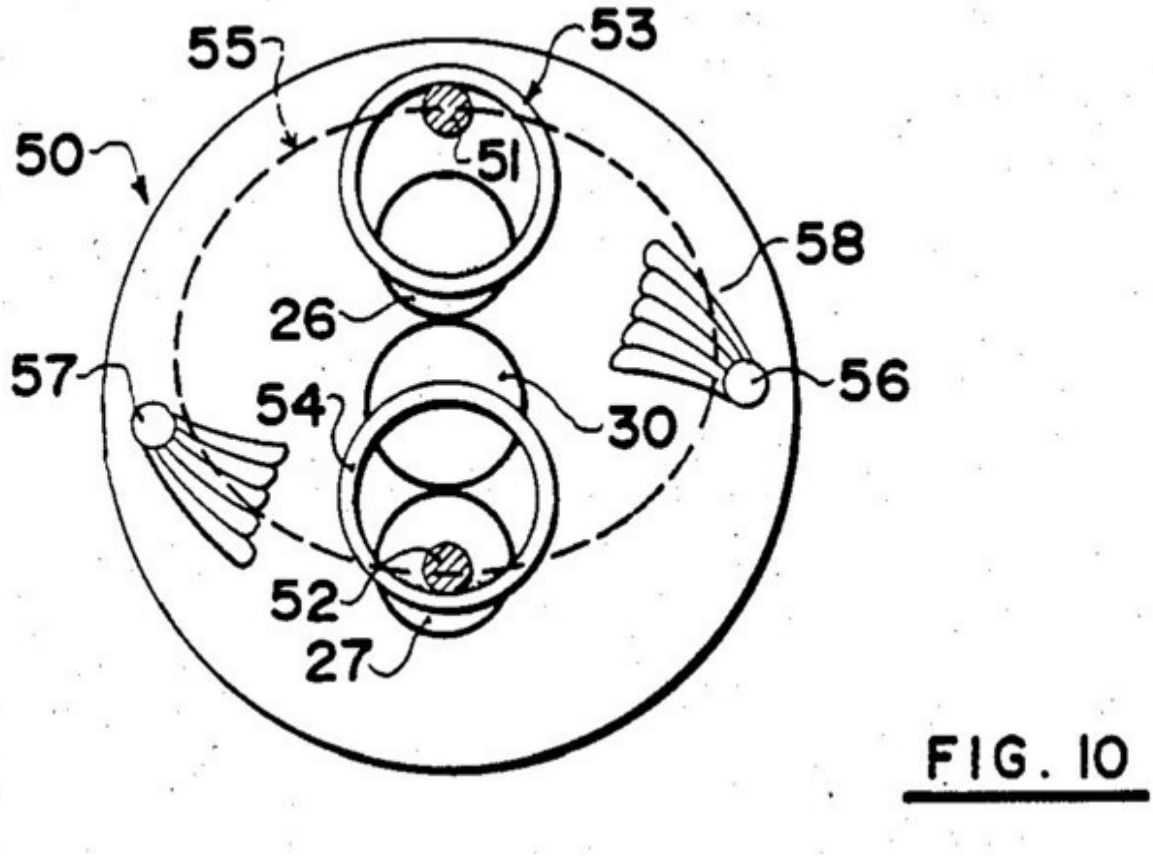


FIG. 10

FIGS. 11 through 15 show sequential positions of the body of FIG. 1 at 45 DEG spacing with the pendulum masses omitted for simplicity of illustration.

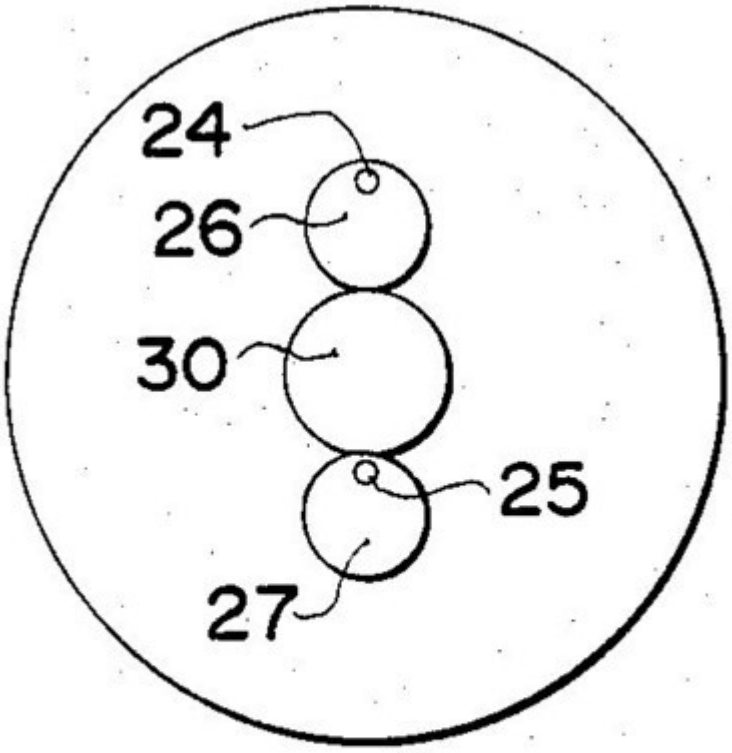


FIG. II

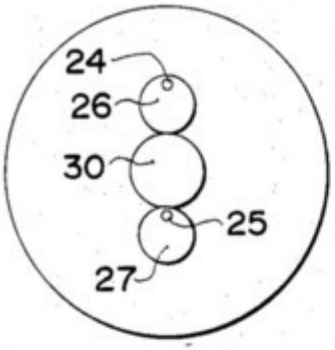


FIG. 11

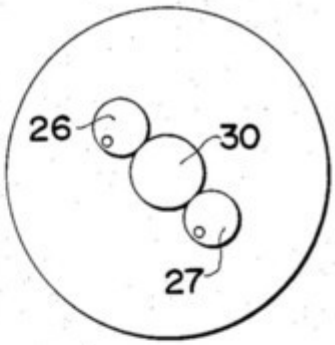


FIG. 12

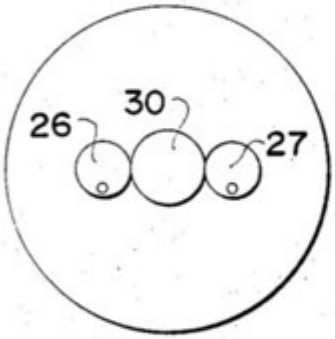


FIG. 13

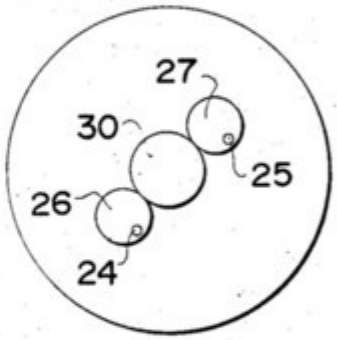


FIG. 14

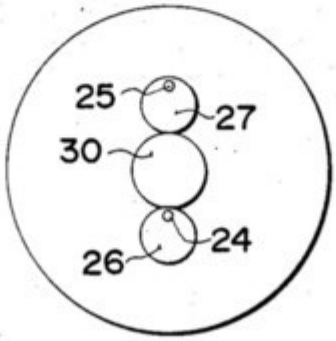


FIG. 15

Referring firstly to FIGS. 1, 2 and 3, one example of a body or EZKL is illustrated and comprises a housing 10 formed in three sections 11, 12 and 13. The section 11 comprises a relatively thick plate having a pair of bores 15 formed approximately half the way through the plate, the bores being of such a dimension that they intersect adjacent the centre of the circular

plate 14 and approach approximately the outer wall thereof. The bearings incorporating a ball-race, support a pair of discs 18, 19 for rotation in the plate.

The second portion 12 comprises a circular plate concentric with the plate 14 so as to close the bores 15 and similarly provides counter bores for receiving a pair of bearing rings 20, 21 symmetrically to the bearing rings 16, 17. Similarly, the bearing rings 20, 21 support discs 22, 23 for rotation about the same axes as the discs 18, 19. The discs 18, 22 are linked by a pin 24 so they co-rotate and similarly the discs 19, 23 are mounted upon a shaft keyed to a respective gear wheel 26, 27 for co-rotation with the respective disc. The shaft is also mounted in bearings 28, 29 provided in the third section 13 of the housing.

In this way, two separate wheels, one provided by the discs 18, 22, the pin 24, the shaft, the gear wheel 26 and mounted for rotation in three bearings, and the other being provided symmetrically by the other discs and co-operating portions are provided. The two wheels are driven in the same direction by a co-operation with a stationary gear 30 mounted in bearings 31 provided on the portion 13 while the body as a whole is rotated by a shaft 32 driven by means (not shown).

It will be noted that the pins 24, 25 are mounted eccentrically relative to the axis of rotation of the respective wheel. It will also be noted that the wheels are driven in opposite directions at the same rate of rotation and hence remain in synchronism.

The pins 24, 25 are mounted near the periphery of the discs and each supports a respective planet mass 33, 34 each of which is, as shown in FIG. 1, circular in plan view and mounted eccentrically relative to the pin such that its centre of mass is spaced from the axis of the respective pin. The bores 15 are of such a dimension that under normal rotation of the discs 18, 19 about the respective rotation axis, the respective mass 33, 34 is flung outwardly so as to lie along a radius joining the rotation axis and the pivot axis of the respective body. The dimension of the bore 15 is chosen such that it is circular with a radius slightly greater than the distance of the furthest point of the mass 33, 34 from the respective rotation axis.

The movement of the gears 26, 27 and the crank pins 24, 25 through 180 DEG of the body movement at 45 DEG spacing is illustrated in FIGS. 11 through 15 and it will be seen that each crank or pin varies in distance from the axis of the stationary gear 30 with the greatest distance of the crank 24 in FIG. 11 and the shortest distance in FIG. 15.

Also in each of the plates 14 is provided a partly annular cut-out 35, 36 each of which contains an electromagnetic coil 37, 38, powered by a power source and timing device schematically indicated at 39. The electromagnets 37, 38 act to inhibit the outward movement of the respective mass, one of which is indicated in FIG. 4 in various positions of its movement.

The path of the rotational movement of the pin 25 is indicated 251 and the rotation axis of the disc 19 comprising part of the wheel, is indicated 252. The path of movement of rotation axis 252 is indicated at 301. Four positions of the mass 34 are indicated respectively at A through D and it will be noted that the position C is inhibited inwarwdly of its normal position so that the centre of mass of the planet mass 34 in the positions B and C is no longer on the radius joining the rotation axis 252 and the pivot axis 25.

In FIG. 5, the position D is shown and also at D1 is shown the position immediately prior to the

position D where it will be noted that the centre of mass of the planet mass has been drawn inwardly relative to the rotation axis 252 and rearwardly relative to the motion of the pin 25.

It will be noted that the effect of the electromagnets or coils 36, 37 is limited to one portion of the cycle of the wheels and immediately downstream of the effect of the coils, the mass is free to swing outwardly about the pivot axis or pin 25 and relative to the rotation axis 252.

The pulling force is produced by the whip-like increased momentum of a dense mass provided by the bodies magnified through a centrifugal force when each body completes this acceleration phase with an abrupt stop upon its return to its normal orbit path and simultaneously it resumes normal orbiting. This very brief abrupt stopping action produces the pulling impulse caused in effect within the device and transfer this unidirectional force to that which the device is anchored or attached upon.

The bodies are concentrically, bearing mounted upon the crank portion of the discs. The motion of the planets is of a pendulum-type nature through 360 DEG. The device therefore comprises two planets mounted opposite each other and contained within their own half section of the device. The action of each planet is contained in its own section area. The main drive shaft 32 is mounted on bearings (not shown) and secured, by means not visible in the section of FIG. 2, to the frame 10. The gear 30 is fixed to bearing 31 and thence to a control mechanism (not shown) to maintain it stationary at controlled positions such that the shaft 32 can rotate relative to the gear but is meshed relative to the gears 26, 27 to ensure their maintaining of positioning of the crank shafts during operation. The housing 10 rotates around the gear 30 so that the gears 26, 27 complete two rotations each as the housing 10 completes one rotation. When the three gears are aligned vertically with the crank portion or pin in an extended or outward position and away from the device main axle 32. Arrangement of this positioning with the device rotating, creates a new planetary orbit within the device. From external observation, this orbit takes on the appearance of an illusionary wheel within the device but its illusionary axis is away from the axis of the shaft 32.

The electromagnets 36, 37 have the ability to influence and hold each planet, when activated. The rotation carries the planets to and away from the electromagnetc field. The electromagnets act to maintain a short radius of the planet relative to the device axle during a specific rotation of the planet orbit and through a special electronic timing device cease magnetic activity releasing the planet at a specific location to return to its orbit where its mass, ending is interrupted journey, produces the pulling force, prior to resuming its normal orbit path and resuming into the cycle. This pulling force release point location is isolated to that position where the radius between the planet and the device axle is at its greatest distance. The velocity of each planet is in a constant harmonious cycle of change.

As the rotation of the housing 10 is held constant, the planet velocity is at a maximum at the release point as the radius to that of the axle 32 is at its most extended point. Its velocity decreases as its gear brings the planet closer to the axle 32. Upon one half turn of the device, the planet crank shaft gear has completed one complete rotation and reduced the radius of the planet relative to the axle 32 to its minimum length therefore reducing the planet's orbit velocity to its slowest orbit speed. The planet orbit velocity continuously increasing then decreasing takes on a cycle wave length like pattern in regard to momentum forces. This pattern is in balance conversely with the opposite planet actions occurring simultaneously. One planet balances the

actions of the other laterally but not perpendicularly.

Operating in a 0 gravity field, a single device as shown would conform to Newtonian law and simply oscillate around its centre of mass as there would be no stabilizing factor to aid the device. The pulling force emittor would cause the device to travel in a circular path due to initial lack of stability or footing to push against.

Hence it is of necessity that a device rotating in a clockwise motion is linked and joined together with a second device as shown in FIG. 7 rotating in a counter-clockwise rotation, vertically aligned, with their pulling pulsations directed together in one direction perpendicular to the centre line of their main axles laterally aligned. The opposite rotating devices are controlled by a device schematically indicated at 40 to rotate synchronously in opposite directions and are turned to emit their pulsations timed exactly together. All lateral movement that occurred with a single device has now been neutralized or negated due to opposite and equal action and reaction and is balanced through the interaction of one device upon the other. The perpendiclar motion of the tandem devices has not been neutralized and when magnets are not activated, each device moves forward and backward between its centre of balance. An inching forward effect may be experienced in operation during that period where magnets are not activated in 0 gravity. These tandem devices with magnet actuation combined with the lateral stabilization through interaction balancing maintain balance as each planet is held in, maintaining the short radii between the planet and device axle uniformly during the planet loading cycle portion of orbit. The pulling forces at the release points of the two devices are greater than that momentum force of the opposite planets at their minimum radii to the device's axle, thereby creating movement in one direction of the devices. Therefore, any objects attached to the tandem devices is carried in that direction of the pulling force release point.

The acceleration of the craft in a 0 gravity or normal gravity field remains constant if rotation is maintained and hence the velocity continuously increases.

Under 0 gravity conditions, decrease of velocity is achieved through reversing the direction of the pulling force release points of the device in the opposite direction.

Manoeuverability is attained in a similar manner through the control of the stabilizing gears of the devices together with the rate of rotation and the magnetic field strength of the electromagnets.

Acceleration of the device can be controlled by varying the rate of revolution of the device, and the magnetic strength of the electromagnets. Momentum acceleration is logarithmically continuous during the operation of the device.

A directional change over 360 DEG plane is attained through adjusting the position of the stabilizing gear 30 which re-locates the release point of the pulling pulsations of the planets.

To cease movement, that is to effect a stopping action of the device and of any objects attached thereto, the stabilizing gear 30 of the device is reversed in direction. The pulling pulsations then act at 180 DEG relative to the initial direction to bring the device to a stop.

It is to be noted that each device must be tuned to operate properly. With the planet in the 6

o'clock position (as shown in FIG. 6 with the shortest radius between the planet and the axle 32), the corresponding gear 27 turns in the same direction as the wheel. The crank portion carrying the free moving planet begins to take the planet back to the electromagnetic field. The magnetic force takes hold of the planet restricting the planet from maintaining its centrifugally created position. The planet pickup begins at the 5 o'clock position. This action restricts the radius between the centre of the planet to the main wheel axle to assure the length compared to its natural centrifugally held position. This holding action is maintained until that line from the centre of the main wheel axle and the centre of the crank gear axle reaches the approximate position of 1 o'clock. Depending upon the r.p.m. of the device and the momentum affecting the size of the planet mass, the timed deactivation of the magnet will occur within an advance and retard control. When the planet is released at 1 o'clock, the timing must be such that mass reaches its extended centrifugal position upon reaching the 12 o'clock location.

The range of pulling force strength is determined by the size of the device and its maximum usable rate of revolution. Each pair of devices delivering a greater pulling force than their weight on earth determine the number of such devices to be used to accomplish the work required.

The most adaptable and suitable method of installation to power a vehicle craft utilizing this pulling force only for craft mobility will be circular and internally mounted for servicing access. The pairs of devices will be matched opposite each other at the ends of diameter at the periphery of the circle of devices. This is illustrated in FIGS. 8 and 9 where the pairs are illustrated schematically at 41 and the circular frame at 42 the mate or pair to each device can be interchanged depending upon the need for craft manoeuverability. Thus for example a mating of the wheels 43 and 44 in a pair will cause an upward force while changing the mated pair to 43 and 45 will cause a sideways movement. Thus the pairs formed by wheels 41, 43, 45 and 46 form a rectangular cell of wheels indicated generally at 451. Two pairs of wheels 431 are arranged in a plane at right angles to that of the wheels 41, 43, 45, 46 to provide maneuverability around the axis of the frame 42. The functions of the devices would be computer controlled, particularly with regard to the rate of revolution, magnetic field strength, advance and retard of magnetic release and central stabilizing gear direction.

The motion of the planets of the pair of devices is schematically illustrated in FIG. 6.

The planet is taken into its orbit through its attraction to the electromagnets causing a warping effect on the planet visual orbit path as shown. As explained previously, the pendulum mounted planet is turned 90 DEG away from its natural centrifugally created position through the effect of the electromagnets on its motion. The planet's momentum and velocity are at their greatest during this orbit phase and the momentum is magnified as the planet is released by the electromagent allowed through centrifigal force to return to the original centrifugally created orbital path at the top of the cycle or the release point. The velocity of the planet now beings deceleration action until it reaches that point opposite and furthest away from the release point which is referred to as the 0 point or shortest radius between the planet and the main wheel frame axle.

Therefore, as the main wheel retains a set continuous rotation, it is observed that the momentum of the planet is a variable, increasing and decreasing pulsations within the wheel.

Visualizing the main wheel and describing the planet's position, with the magnets not activiated,

it is noted that their relative momentum is equal at the 3 and 9 o'clock positions. It is further noted that at the 0 point or 6 o'clock position, the momentum of the planet mass is less than that relative to the mass momentum at 3 and 9 o'clock positions. The planet velocity at the release point or 12 o'clock position is at its greatest.

When the electromagnets are activated, there is produced a visual warping of this orbit path as shown in FIG. 6. This effect is produced by a magnet holding the planets steadfast after leaving the 0 point where it begins the acceleraton portion of the cycle. Therefore, the planet's momentum remains constant and does not increase during this holding portion of the orbit's cycle. The planet is out of its centrifugal balance position. Prior to the planet reaching the release point area, allowing the planet to return to its centrifugal position. During the planet's return, it is observed that the velocity of the planet has been further increased through centrifugal force as the planet pendulums itself to its original orbit path. The inertia of the kinetic energy of the planet mass is dispersed at the end of its momentum acceleration completion at the release point position resuming its orbit position and again begins its next orbit velocity changing cycle.

The planet therefore produces a pulling effect upon the disc to which it is attached and this pull is transferred to the main wheel frame to which it is seccured.

Referring now to FIG. 10 there is shown a modified arrangement incorporating a wheel generally indicated at 50 of the type illustrated in FIGS. 1, 2 and 3 incorporating the stationary gear 30 and the rotating gears 26 and 27 which provide the axes which rotate around the shaft 32 (not shown in this figure). In place of the planet masses 33 and 34 which are formed as simple pendulums eccentrically mounted on the gears, the planet masses of this arrangement are provided by weights 51 and 52 which are constrained to move within a pair of rings 53 and 54. The rings are carried on the rotating gears 26 and 27 eccentrically relative thereto so that again the masses 51 and 52 are constrained to move relative to the wheel 50 in a path illustrated in dotted line at 55. In view of the eccentricity of the mounting of the rings on the gears, the path lies closer to the axis of the fixed gear 30 at the 6 o'clock position as illustrated at 52 than it does at the 12 o'clock position as illustrated at 51. Thus the planet is moving at a maximum velocity at the largest distance at the 12 o'clock position. The use of rings in place of the rigid eccentric mounting of the pendulums of the earlier embodiment enables a greater degree of freedom of the movement of the masses 51 and 52 so that a greater kink or distortion of the path can be obtained by the electromagnetic restraining devices schematically indicated at 56 and 57.

The position of the rings on the gears can be adjusted so as to vary the eccentricity whereby the movement of the masses can be tuned for greatest efficiency.

In addition in this embodiment the electromagnetic devices 56, 57 have a plurality of separate fingers or portions 58 which can be separately actuated in order to control the timing and positioning of the electromagnetic effect. It will be appreciated that as the angular velocity of the wheel 50 changes under control of the device 40 illustrated in FIG. 7, the path of the planet masses 51 and 52 will vary and therefore in order to properly tune the device the position and timing of the electromagnetic effect must also be variable.

The device shown in FIG. 8 is in a suitable propulsion system for a vehicle. A simplified propulsion system can be obtained using two rectangular cells of the type indicated at 451 each of four wheels and arranged at right angles. This can be mounted in a propulsion pack including

a suitable power source in the form of electric motor for driving the wheels.

In a further alternative arrangement (not shown) one or more of the rectangular cells formed by four such wheels could be mounted on a belt or harness which could be particularly effective in supporting a parapelegic or other person who would otherwise immobile.

Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

Mark TOMION Electrodynamic Field Generator

http://www.stardrivedevice.com/

phone: (585) 526-5350
fax: (585) 526-5936
e-mail: office@stardrivedevice.com

---

http://www.americanantigravity.com/articles/50/1/Mark-Tomion-Interview/Page1.html

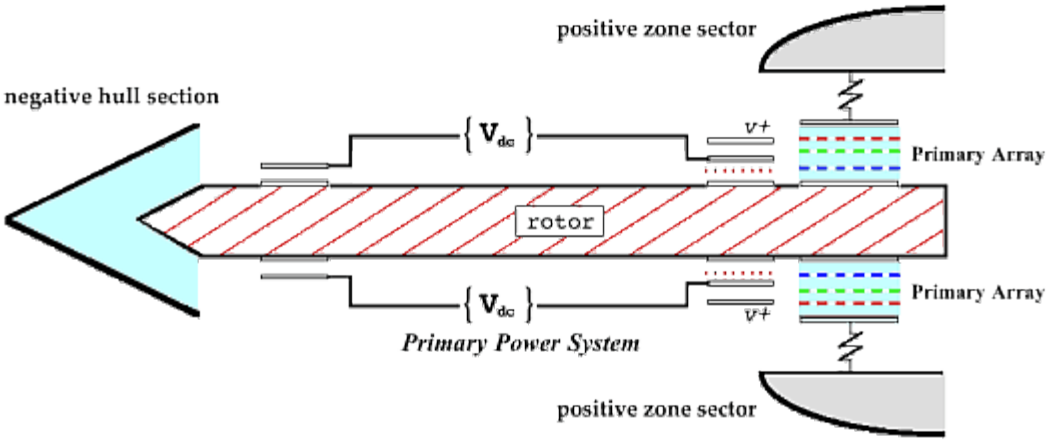
Interview: **http://www.intalek.com/AV/Mark-Tomion.wma**

StarDrive Device

Date: October 28th, 2004
File Size: 1.71mb (11kbps)
Format: Windows Media 10

Overview: Inventor and Electrical Engineer Mark Tomion joins us to talk about his patented StarDrive Device, a modified SEG that he claims is capable of revolutionizing space-travel. Tomion holds patent #6,404,089 on an "Electrodynamic Field Generator".

The primary advantage of Tomion's research is having converted the otherwise esoteric "Searl Effect Generator" into a rigorously-researched set of Electrical-Engineering equations, that he claims can reproduce the effects of the SEG within the confines of contemporary science & technology.



http://www.stardrivedevice.com/

Excerpt: Chap. 11, *StarDrive Engineering*

"The Quest for Quantum Gravity"

by

Mark R. Tomion

"The preceding material will hopefully prepare us for a look at some very basic trans-light mechanics, for I will acknowledge myself to be conversant with respect to such an abstract and complex concept only in general terms! It should be possible, however, for us to examine certain fundamental principles which may be involved in the workings of a hyperspace "warp-jump" with an application of straightforward logic and a couple of basic relativistic formulas that are actually easy to work with.

"The analytical procedure we'll use in this discussion derives from the method of breaking the time-light barrier that was proposed at the end of the last Chapter: whereby a StarDrive [EDF] Generator will be driven to a speed sufficient to cause its relativistic mass to very closely approach a level which would ordinarily correspond to the Chandrasekhar limit [about 1.4 solar masses] in reliance upon its Field electron degeneracy pressure to prevent the formation of a neutron object or a black hole. In doing so, it is hoped that an open-ended wormhole will arise which is navigable by means of the Lorentz transformation, in accordance with the work of Olexa-Myron Bilaniuk.

"In order to work with the largest values for starship mass and Field electron velocity (as a function of Field voltage), data will be supplied for a vessel 100 feet in diameter – which as I've said is the largest model advisable using this technology. What we will do first is calculate such a vessel's total relativistic mass at a velocity which corresponds to its Field electron collision speed: the reason being that it will be interesting to see what happens when the starship reaches a velocity which a reactionary ion-thrusted rocket, having the same exhaust speed, couldn't possible exceed.

"The next step will be to compute the starship's expected foreshortening in the direction of travel, according to the Lorentz contraction* which is an inevitable consequence of relativity. This 'shrinking' of the vessel's length along its axis of velocity may be figured according to the most fundamental factor or expression in relativity theory, which is sometimes called the FitzGerald

ratio. This factor, usually designated t (tau), is equal to (1 – v2/c2)1/2 and is used in any calculation of relativistic mass or time dilation.

It must be noted here that while the Lorentz contraction does not involve any actual subjective physical deformation of an object with relativistic velocity, it is nevertheless a very real effect and does indeed involve the non-uniform relative deformation of the space-time in which such an object is moving.

"Since the computations we will be making here are only intended to constitute the roughest of approximations, being largely illustrative and instructional in nature, a related parameter called the Schwarzschild radius will then be calculated. This radius defines the physical size at which a 'cold' spherical object cannot avoid becoming a black hole. Again, this expression is actually very simple: Rs = 2GM/c2, where c is the speed of light, M is the total mass, and G is the universal gravitational constant (at 6.6726 x 10–11 nt-m2/kg2).

"Our goal in this endeavor is then simply to observe how closely the ship's foreshortened half-length approaches its Schwarzschild radius! We will let Lo equal the starship's rest length, while bearing in mind that it will drive upper-face-on during space flight, and this "length" (or hull height) is equal to 2(hz + hf); then, Lr will be the resultant contracted length. If we assume that one half of Lr will need to approach Rs as closely as possible in order for a stable wormhole to be induced, we can state our tentative trans-light or "warp drive" parameter thusly: Lr/2 > Rs .

The max. net cabin volume available aboard any size StarDrive vessel is outlined in yellow ? above.

Serious "starship design" enthusiasts should take a look at our Manned Vessel Design DataSheet [weight, displacement, Field voltage, & peak rotor current for vessels of 40, 60, 80 and 100 feet in dia.; (**http://www.stardrivedevice.com/vessel_design_data.pdf** ; 2 pgs., 283kB)]

"Using the pdf Hull Configuration Spreadsheet [**http://www.stardrivedevice.com/hull_config.pdf**], the hull volume or displacement of the 100ft.-dia. "Toltec" is 39,168 ft3 and, at a weight/volume ratio of 79.2 lbs/ft3, the starship's rest mass (Mo) is 1.4071 x 106 kg. And, it turns out that the value for Lo is equal to 4.205 m. The equations in steps [1] ~ [4] on pg. 119 (in the 'FIELD POWER OUTPUT' worksheet) may then be used to calculate the peak Field electron velocity and a corresponding value for t, but we must first know the value for peak Field voltage. Using the [standard specification] method developed in WorkSheet I(a), this Field voltage value is 4.9383 x 109, or nearly 5 billion volts!

"Accordingly, the peak Field electron velocity is between "8- and 9-9's light": in other words, 0.999 999 995 c. [It should be noted that in performing relativistic calculations, you basically can't use too many decimal places!] The contingent value for t is then equal to 1.0000 x 10–4. The ship's total relativistic mass is equal to Mr = Mo/t, at 1.4071 x 1010 kg; and, Lr = Lo(t) = 4.205 x 10–4 m. Computing the rough value for the 100ft. starship's [theoretical] Schwarzschild radius, we find that the vessel's Rs = 2.0893 x 10–17 m; and, Lr/2 is equal to 2.1025 x 10–4 m. So, we can see that the foreshortened half-length is indeed greater than the absolute minimum safe value, but by many orders of magnitude instead of only marginally: in fact, about ten trillion times greater!

"However, if we calculate the critical density of an object of Chandrasekhar limit mass and Schwarzschild radius, this density is equal to 9.4 x 1018 kg/m3. Then, if we compute a relativistic density for the 100-foot starship, neglecting its non-sphericity and assuming that its hull volume is reduced by the given Lorentz factor t, we find this relativistic density equal to 3.9845 x 1012 kg/m3. Now, that limit critical density exceeds the starship's said theoretical

relativistic density by "only" 2.36 x 106 or 2.36 million times. To actually achieve a Schwarzschild critical density, by which time we know a warp field must be induced, we can merely allow our starship to apply positive reactionless acceleration a bit longer to raise its velocity just slightly above Field impulse velocity and lower its factor t by (2.36 x 106)1/2 or 1,536 times: this will yield t = 6.51 x 10–8, and a starship Mr = 15,360,983 Mo.

"So, it would seem that the latter 'trans-light parameter' will tend to indirectly verify a StarDrive vessel's ability to induce a metric warp field, although the first such exercise did not. And, I can't presently say just how close such a ship must come to equality with either parameter that we developed above (the latter being preferred). It also seems reasonable to postulate, however, that a narrow velocity range will exist within which the desired wormhole effect is stable: on the lower end of such a "safety zone", the vessel risks "dropping out of warp" (with a bothersome loss of time and energy), and on the high end its mass [Mr] risks a rapid ascent to certain disaster! This latter effect I feel would be a consequence of the starship's magnetic field, which so far we have not even considered. And, at the levels of charge and velocity we're considering, the strength of the magnetic field "corridor" associated with such a vessel will be truly tremendous! Remember what we learned about 'magnetic energy density' in relation to the Tokamak equation?!...

"By far the most important consideration to bear in mind, however, is that a StarDrive vessel represents an asymptotic reactionless drive, and therefore the ship's ultimate velocity is not limited to the velocity of the electrons comprising its isometric Drive Field. Unlike most forms of rocket, it is free to accelerate beyond its "exhaust" velocity – and to achieve an ultimate velocity in space-time which is only infinitesimally less than that of light. Therefore, an unmanned probe Drive Unit could be turned loose to accelerate until its relativistic mass becomes almost astronomical, and it either finds a stable warp corridor within such a safety zone or is destroyed in the process".

---

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=6404089.PN.&OS=PN/6404089&RS=PN/6404089

http://v3.espacenet.com/textdoc?DB=EPODOC&IDX=US6404089&F=0

US # 6,404,089

(June 11, 2002)

Electrodynamic Field Generator

Abstract -- This device is a brushless high-voltage electrical generator, requiring suitable means of input rotary torque, for purposes of producing a very-high-energy external electrodynamic field or continuous quasi-coherent DC corona or arc discharge of uniform current density which completely encloses the machine's conductive housing. This housing is divided into distinct electrical sections and contains a flat conductive rotor which electrically links separate negative and positive housing sections and upon which a plurality of toroidal generating coils are rotatably mounted. Circular arrays of stationary permanent magnets are affixed within the housing which induce a constant DC voltage within said coils upon their rotation. The primary voltage so-generated is electrostatically impressed across the rotor such that great quantities of electronic charge may be transported between the opposite polarity sections of the housing, in such a manner that a much higher secondary voltage is caused to appear across interposed neutral sections thereof, and the resulting external breakdown current once initiated is

independent of the generating coils' ampacity. Ancillary mechanical, electrical, an/or electronic features may be attached upon or within the housing to aid in harnessing and controlling the useful effects associated with the external dynamic electric field produced by the device.
Inventors: Tomion; Mark R. (Geneva, NY)
Appl. No.: 09/621,152
Filed: July 21, 2000

Current U.S. Class: 310/162 ; 244/23A; 244/23C; 290/1A; 290/1R
Current International Class: H02N 11/00 (20060101); H05H 1/24 (20060101); B64C 39/00 (20060101); H02K 001/00 (); H02K 005/00 ()

References Cited [Referenced By]
U.S. Patent Documents

1889208 November 1932 Masterson et al.
2949550 August 1960 Brown
3071705 January 1963 Coleman et al.
3177654 April 1965 Gradecak
3464207 September 1969 Okress
3620484 November 1971 Schoppe
3662554 May 1972 Broqueville
3774865 November 1973 Pinto
4733099 March 1988 Hutson, Jr.
4789801 December 1988 Lee
4900965 February 1990 Fisher
5291734 March 1994 Sohnly
5382833 January 1995 Wirges

Foreign Patent Documents:

GB2312709 May., 1997
WO85/03053 Jul., 1985 WO

Also published as: WO0209259 (A1-corr) // WO0209259 (A1) // EP1312152 (A0) // CN1462500 (A) // CA2416871 (A1)

Description

FIELD OF THE INVENTION

The present invention is related in general to rotary direct current (DC) electrical generators which incorporate permanent magnet fields, and in particular to similar electromechanical generating devices whose principal purpose is to produce a useful continuous high-voltage DC corona discharge. This invention also pertains to the field of aerospace vehicles which are capable of propulsion through the utilization of an ultra-high-voltage corona or arc discharge of a special type and form.

DESCRIPTION OF RELATED ART

In order to provide background information so that the present invention may be completely understood and appreciated in its proper context, reference is made hereinbelow to a number of related art patents. These cited references contain certain similarities to the present invention, primarily related to the objective of producing electrically-developed thrust. However, key differences and limitations with regard to achieving this objective are in evidence.

The related art disclosed in U.S. Pat. No. 2,949,550 proposes three attendant objects which are quite similar to certain of the objects of the present invention: (i) to provide an apparatus for the direct conversion of electrical potential to usable kinetic energy; (ii) to provide such an apparatus having a hollow body or housing which contains a source of high electrical potential; and (iii) to provide a self-propelling vehicular apparatus which includes a pair of electrically conductive body portions joined by an insulative portion, whereby said conductive portions constitute electrodes. A further similarity is that the vehicular embodiment proposed preferably be of a circular disc shape somewhat thicker in its center than at its edges. The device set forth in this Patent just cited is noticeably different from the present invention, however, in that a positive voltage is applied to the housing periphery and a negative voltage is applied at the central axis. The proposed arrangement is furthermore limited to operation within a gaseous dielectric medium, upon which it is reliant for the production of the claimed motive force, and is to be operated at a potential gradient less than that which would produce a visible corona. This device moreover makes no provisions for the production and/or extraction of vast quantities of useful thermal kinetic energy, as the present invention does.

The related art disclosed in U.S. Pat. No. 3,071,705 is based on three empirical principles of electrostatics which also figure prominently in explaining the actual shape of the discharge current field that will be produced by the present invention: (i) electrostatic lines of force tend to concentrate on the surface of a charged conductor in those places with the smallest radius of curvature; (ii) they are normal to the surface from which they emanate; and (iii) they do not cross but will bend under the influence of another charged body. The device set forth in this Patent just cited is in fact quite similar to that of the Patent cited immediately before, in that relatively massive positive atmospheric ions and entrained neutral air molecules are repelled from the positive electrode toward the negative electrode along a linear axis--thereby inducing an air flow or "electric wind" which represents the fundamental source of thrust. It is therefore once again limited to operation in a gaseous dielectric medium, and does not make use of a flow of negative and greatly less massive electron current in the course of thrust production--which may achieve comparatively enormous acceleration and even relativistic velocity and specific impulse at a similar given level of applied potential gradient--as the present invention does.

The related art disclosed in U.S. Pat. No. 3,177,654 actually addresses the issue of producing electrically-developed thrust which is not limited to atmospheric operation, and the stated primary object thereof is to provide a propulsion system for enabling controlled flight in the atmosphere which may continue extensively into space without changing the system's basic operation. One embodiment thereof also proposes a circular disc-shaped vessel wherein high-voltage electrode elements ionize atmospheric gases by corona discharge, and a pulsed electromagnet arrangement causes the ejection of the resultant plasma from the propulsion chamber--producing thrust by reaction. This device furthermore addresses the issue of producing local thrust differential(s) on the body or housing thereof, for purposes of flight maneuvering and/or directional control, by providing for a plurality of such pulsed discharge propulsion units arranged in concentric rings (within the discoid body) and having individual divergent nozzles. As such, however, the device set forth in this Patent just cited actually constitutes an ionized jet propulsion method, requiring the use of either a gaseous medium like air or the onboard storage and release of relatively massive ionizable reaction material for any operational capability in space. Moreover, the pulsed mode of operation used, which limits the ionizing potential gradient to a value of less than breakdown field intensity, significantly restricts the level of power produced as thrust as compared to the continuous DC discharge field current produced by the present invention--at voltages which may be greatly in excess of breakdown intensity. Finally,

this said device relies upon an unspecified source of generated electrical power in operation which must be assumed would have to be nuclear if conventional in nature, for said device to avoid otherwise having to carry a massive and range-limiting onboard store of fuel, and not upon convenient and protracted-use permanent magnets of high energy density as the prime energy source (as the present invention does).

U.S. Pat. No. 3,464,207 discloses a quasi-corona aerodynamic vehicle which bears only a limited relationship to the present invention, but which is referenced nonetheless as being further indicative of the predominant trend in conceptualization in relation to devices intended for producing electrically-developed thrust. This device also relies upon pulsed corona discharge operation between spaced electrodes at less than breakdown field intensity, thereby greatly constraining the propulsive power obtained. It is furthermore effective only in a gaseous dielectric medium and is based upon an electric wind pressure gradient arising of an admitted incompletely-understood mechanism. This same device evidences a great deal of theoretical complexity and construction material specificity, which might seem to indicate a narrow range of feasibility. Such attributes are not uncommon in the field of electrical aerospace propulsion, and are, to a degree, shared even by the present invention. Nevertheless, it is interesting to note that sizeable thrust in the form of an aerodynamic pressure gradient or lift of up to 30 lbs./ft.sup.2 of external electrode area or more is asserted to be obtainable from said same device by utilizing asymmetrical electrodes or electrode arrays, rather than using electrodes or electrode arrays of approximately equal area (as the present invention does)--which therefore present a uniform cross section of discharge current conduction.

PCT Application WO 85/03053 discloses a flying apparatus whose primary similarity to the present invention is that it incorporates a hollow annular flywheel which provides gyroscopic stability and encircles a relatively stationary central cabin and/or payload area. The device set forth therein also provides free-rolling means to center and stabilize the flywheel or rotor within a discoid housing, and addresses the issue that horizontal flight maneuvering and/or directional control may be accomplished by altering the local angular acceleration of the rotor--as does the present invention. This said other device, however, relies upon the questionable concept that the very large angular momentum of the rotating flywheel is somehow able to compensate the potential energy caused by gravitation and that the overall weight of the apparatus may thereby be annulled. Vertical lift must then be provided for said device in operation by atmospheric thermal updraft means, and no electrical discharge means are utilized to produce a force of lift or thrust.

The device set forth in UK Patent GB 2 312 709 A is a flying craft which is essentially disc- or saucer-shaped and which has a central axial post electrode and a spaced enclosing ring electrode whereby an electrical arc may be struck between the two, to either ignite fuel introduced via nozzles or greatly heat an exhausted air flow produced by fan means. Thus, this device actually provides hybrid jet or turbo-fan means for producing propulsive thrust, and utilizes direct electrical discharge not as the primary source of thrust but to enhance thrust produced by other means. To this end, said device must therefore operate solely in a gaseous atmosphere and/or carry onboard a range-limiting store of combustible fuel. This same device does, however, utilize powerful magnetic fields to impart a rotational and de-randomizing aspect to the arc discharge, thereby promoting a more uniform distribution of the arc discharge field's energy, as does the present invention.

In summary, a number of similar or significant electrical, magnetic, and mechanical features of the several related art devices have been examined but, whatever the precise merits and advantages thereof, none of said devices achieve the correct combination of such features

required to fulfill the purposes of the present invention. In this respect it may be stated that none of these related art devices attain the distinction of being able to operate extensively in the vacuum of space without the onboard storage of relatively massive reaction material for the production of thrust. Furthermore it would appear that none of these same devices utilize a charged conductive housing comprising suitably disposed electrodes and/or electrode arrays to create and control an asymmetrical electromotive field of force on itself without expelling a reaction mass, whether in a gaseous dielectric medium or the vacuum of space, to achieve a propulsive object as the present invention does. Finally, it is observed that none of the aforementioned related art devices can develop this type of useful thrust-producing electrodynamic field in a manner which allows more than one objective function to be fulfilled thereby, such as the production of useable thermal kinetic energy and/or the development of potential signal communications capability.

SUMMARY OF THE INVENTION

The present invention is a brushless permanent magnet electrical generator which produces a useful ultra-high-energy external electrodynamic field, or continuous quasi-coherent DC corona or arc discharge of uniform current density, that completely surrounds and encloses the machine's symmetrically disc-shaped conductive housing and tends in consequence toward a balanced bihemitoroidal shape.

The invention incorporates a uniform arrangement of stationary electromagnetic armatures which may be employed as a group to impart a holistic and de-randomizing rotational force to the external discharge current that acts to inhibit the formation of concentrated arc streamer or channel phenomena, and thus to assist in rendering the electrodynamic field quasi-coherent in nature. The arrangement of electromagnetic armatures in said generator acting as a group simultaneously also contribute a portion of the machine's required input rotary torque upon the current-carrying rotor assembly thereof.

This invention provides a permanent magnet high-voltage generator wherein the primary DC voltage induced within its rotating coils is electrostatically impressed across the conductive rotor assembly thereof, in a brushless manner utilizing vacuum tube cutoff bias techniques, such that a secondary DC corona or arc discharge current is thereby initiated about the housing thereof which is orders of magnitude larger than the operating current through the said coils.

The said high-voltage primary generator of the invention then has a housing or hull which is divided into separate negative (emitter), neutral, and positive (collector) electrical sections, such that the continuous external flow of such discharge current is best facilitated and conducted internally by the proximal rotor, and wherein suitable means to circulate one or more form(s) of liquid coolant through any one or more of said housing sections may be employed for purposes of extracting an extremely high level of recoverable thermal energy (arising from such discharge current)--which is intended principally for use in the large-scale production of electrical power and/or distilled or desalinated water.

This invention as an electrodynamic field generator also provides an appreciable and practical level of electrically-developed thrust, from the relativistic impulse of an induced ultra-high-voltage external DC arc discharge current incident upon its positive (collector) housing sections, which may be rendered variably non-isometric in nature and therefore directionally propulsive by means of selectively controlling: (i) the resistance of the brushless electrical linkages between the positive housing sections and the proximal current-carrying rotor; and/or (ii) the magnetic flux output of the various stationary electromagnetic armatures.

The invention as an ultra-high-energy field generator furthermore presents a unique yet practicable method of producing a variable electromagnetic and/or gravimetric signal, by means of which useful information may be both transmitted to and received by a separate similar device, in further harnessing the effects associated with the device's external electromotive field. The relationship of said field effects to quantum potential vacuum fluctuation theory just now being studied, which may allow the devising of such a signal having an unconventional nature, is referred to again below.

In any event, the electrodynamic field generator described may be feasibly manufactured and marketed in various sizes according to need or desire in pursuit of its remarkable objects; may be operated either in a gaseous dielectric medium or in the vacuum of space; and may incorporate ancillary mechanical, electrical, and/or electronic features upon or within its housing to accomplish all the objects set forth hereinabove.

Briefly, in accordance with the preferred embodiment of the invention, first provided is a flat annular segmented rotor of very high conductive ampacity which is rendered capacitive in nature by the attachment of suitably paired electrode rings. Alternating in placement amidst such capacitive ring pairs are also attached on the rotor a series of toroidal generating coils of very large mean radius relative to the cross-sectional radius thereof. The resultant composite rotor assembly is then rotatably mounted within a sectional conductive housing. The potential energy inherent in the fields of ring-shaped stationary permanent magnets, which are affixed in concentric circular arrays within the housing, is utilized to electrically polarize the rotor across its radial annular width by means of the "primary" DC voltage created upon relative rotational motion between such coils and magnets. The thereby polarized rotor is electrically linked on one hand (about its positive inner circumference) to two axially-central collector housing sections, by electrostatic induction via a system of plane-parallel electrode elements, and on the other hand (about its negative outer circumference) to two radially-peripheral emitter housing sections across an evacuated space charge chamber. The rotor's subsequent transportation and storage of electronic charge between the proximal opposite-polarity sections of the housing causes a much higher "secondary" voltage to appear across interposed neutral sections thereof and results in a continuous ultra-high-energy DC discharge current flow about the housing externally and across the rotor internally.

BRIEF DESCRIPTION OF THE DRAWINGS

The benefits and advantages attendant to the invention and its objects as discussed hereinabove are best illuminated through the following drawings and description.

FIG. 1 shows a side sectional view of the invention's peripheral and principal working structure, comprising a rotor assembly as well as frame-mounted elements.

Fig. 1

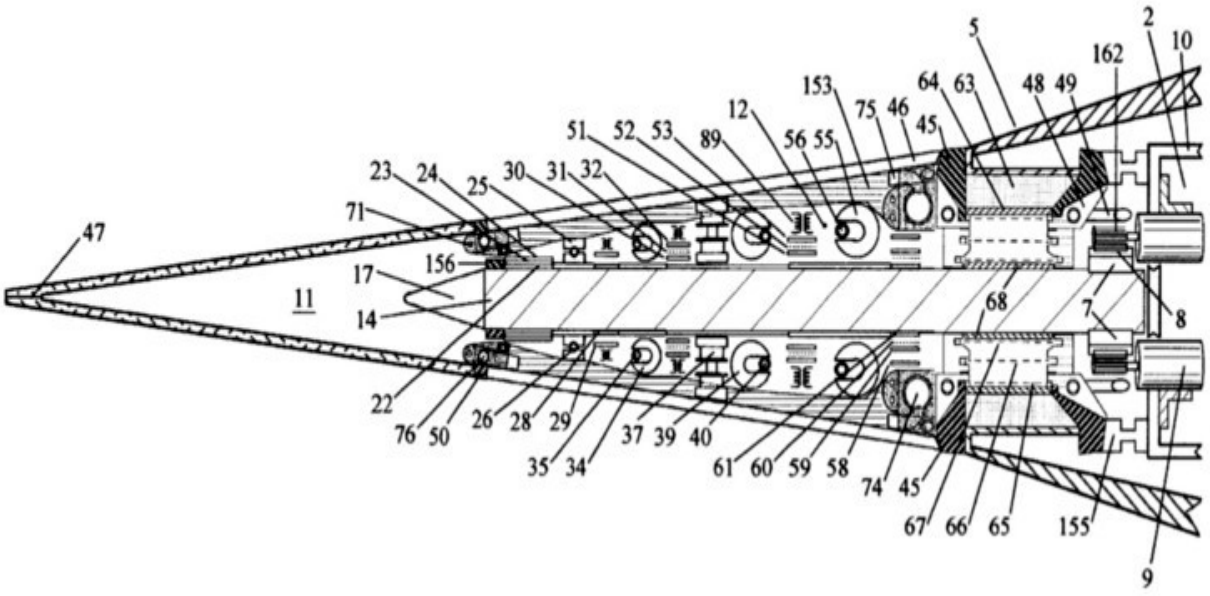


FIG. 2 shows a top sectional view of a 30.degree. radial sector of that same working structure.

Fig. 2

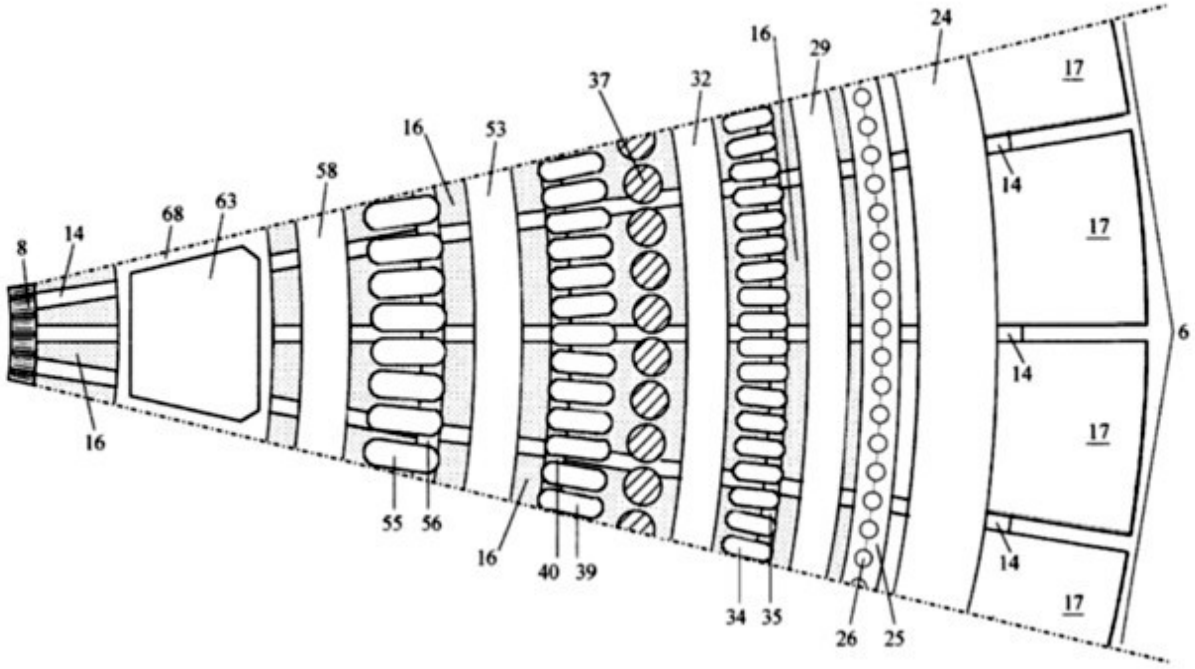


FIG. 3 shows a side view of the invention's symmetrical housing or hull configuration.

Fig. 3

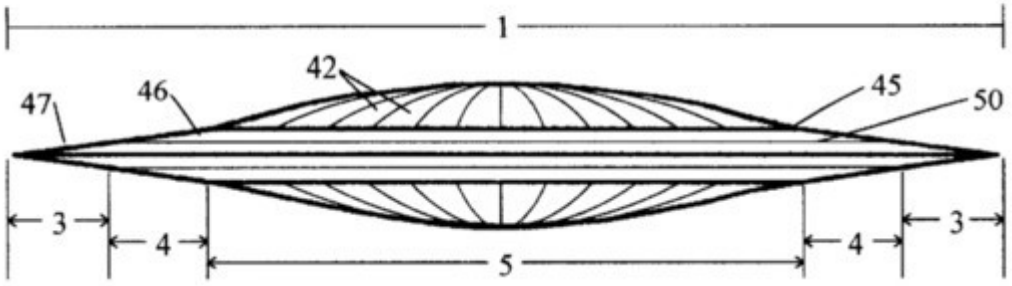


FIG. 4 shows a top view or bottom view of that same housing/hull configuration.

Fig. 4

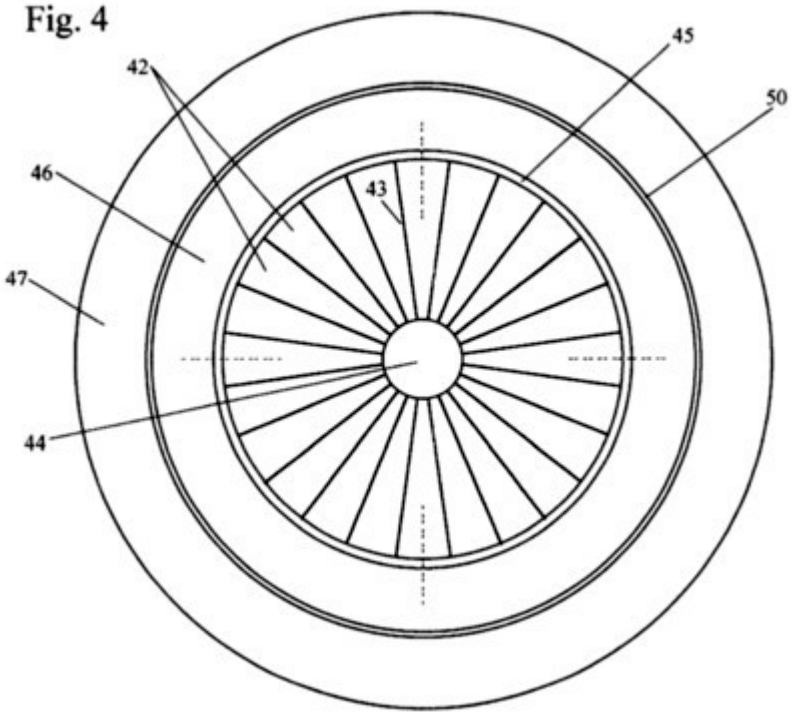


FIG. 5 depicts a small radial sector of the basic rotor assembly construction, in top view, details of the rotor segments, inter-segment insulators, and field emitters.

Fig. 5

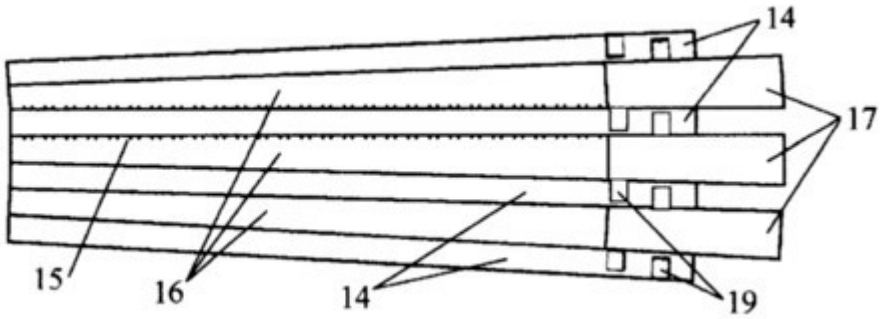


FIG. 6a and 6b show side and top views, respectively, of one of the invention's conductive rotor field emitters.

Fig. 6a

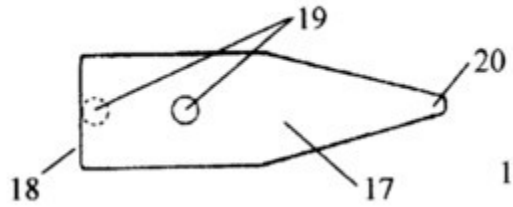


Fig. 6b

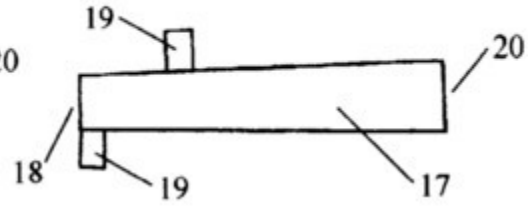


FIG. 7 shows a simplified schematic representation of the invention's two "primary induction ring" electrode arrays, in relation to the rotor electrical circuit.

Fig. 7

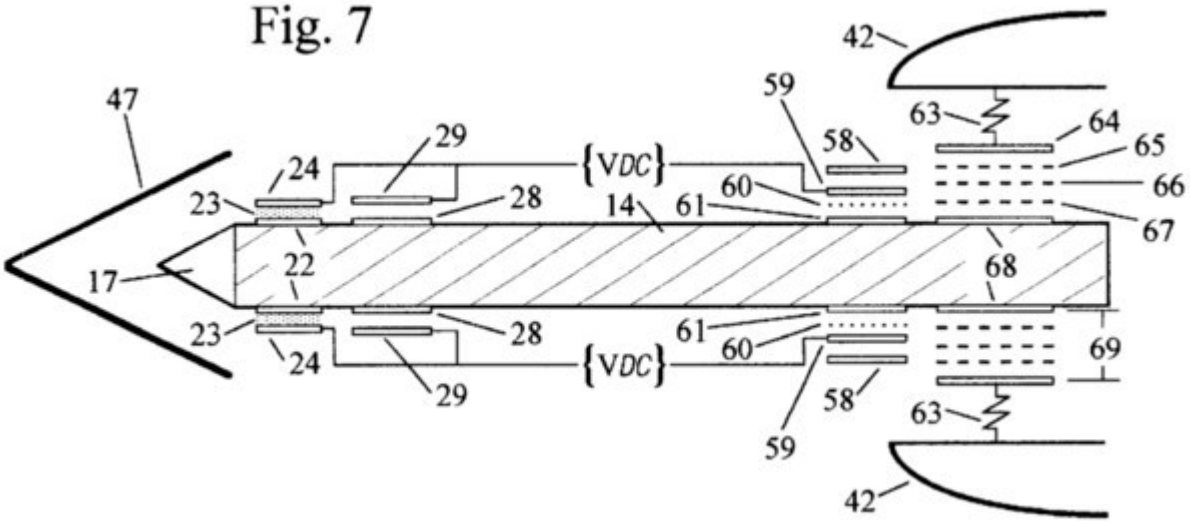


FIG. 8 shows a schematic of one symmetrical half of the primary power system circuit of the invention, in a "single-stage" rotor construction embodiment.

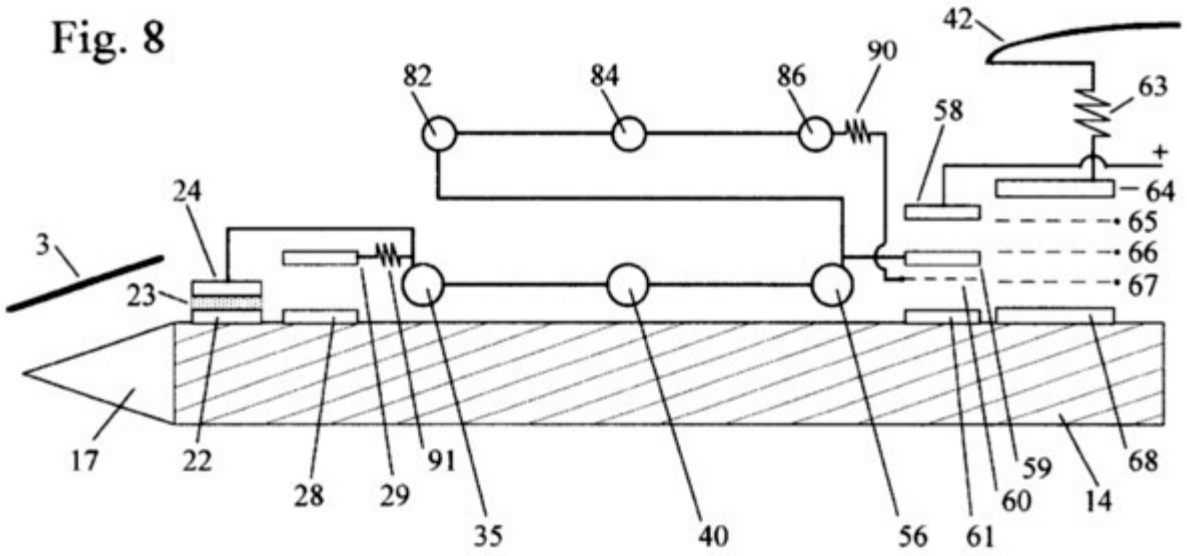


FIG. 9 shows a schematic of one symmetrical half of that same primary power system circuit, in a "three-stage" rotor construction embodiment.

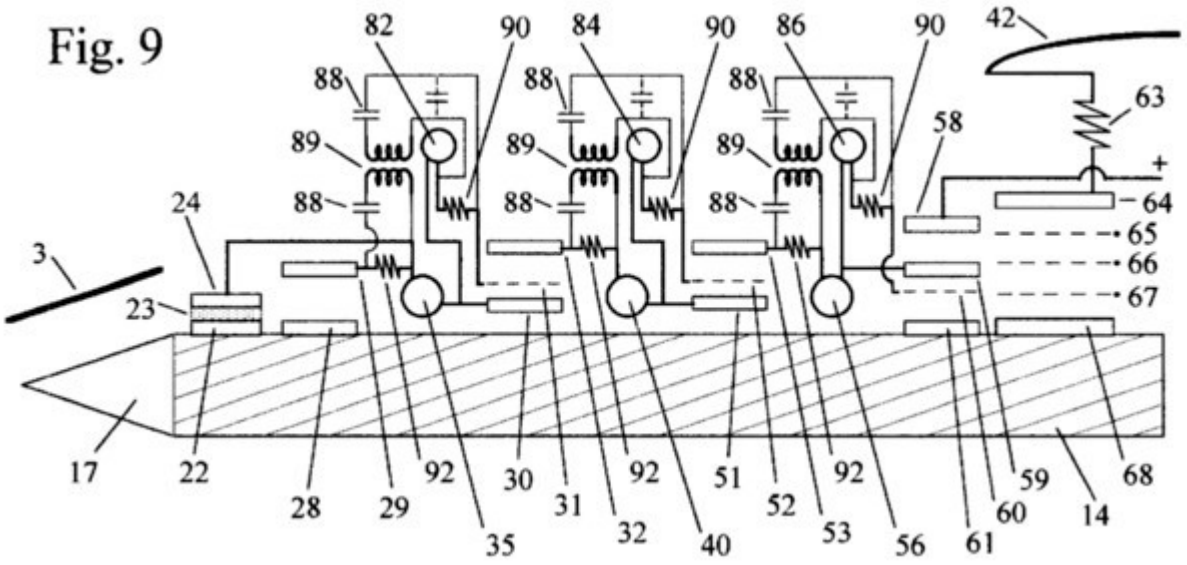


FIG. 10 shows a schematic of the field voltage control system circuit of the invention.

Fig. 10

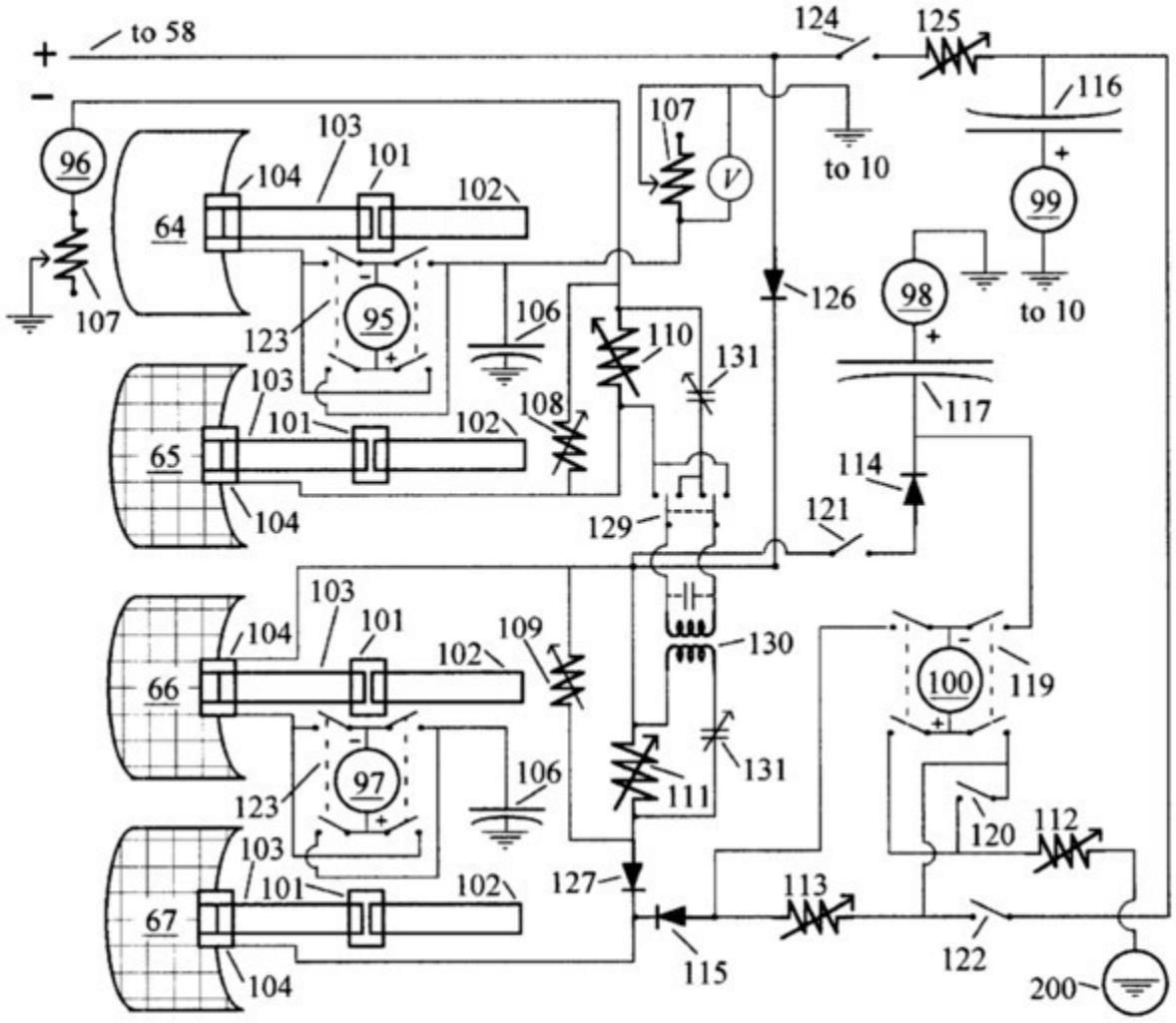


FIG. 11 shows a simplified diagram of the electrodynamic field "envelope" produced by the invention, around a side view of the invention's housing/hull.

Fig. 11

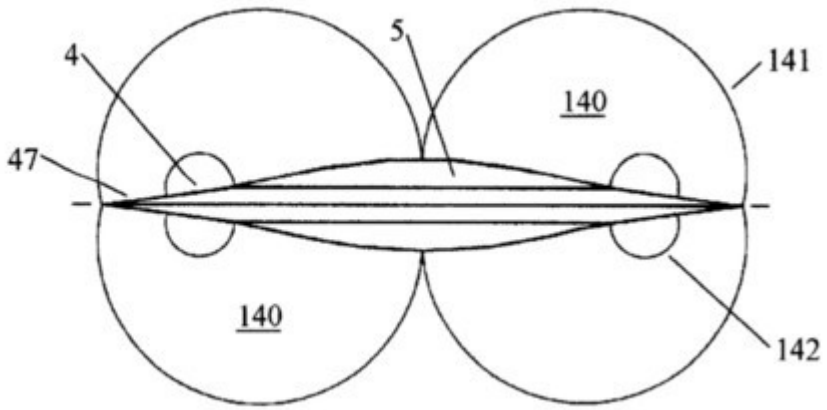


FIG. 12 shows the diagram of FIG. 11, with the addition of lines indicating the electric and magnetic field vectors comprising that same electrodynamic field envelope.

Fig. 12

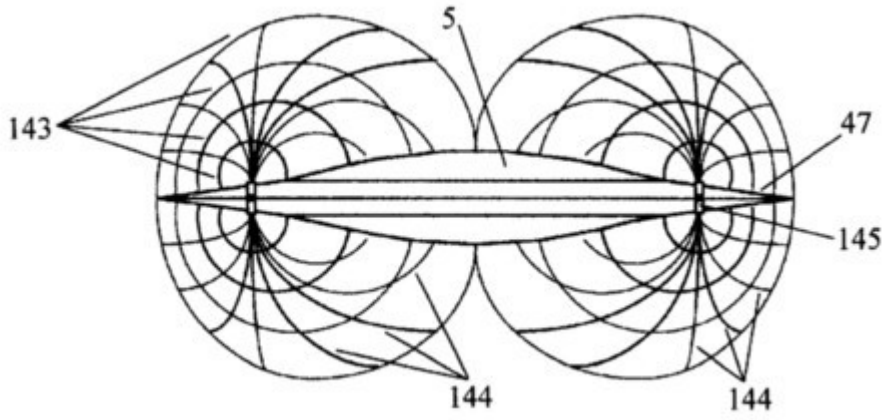


FIG. 13 shows a top or bottom view corresponding to the side view of FIG. 12.

Fig. 13

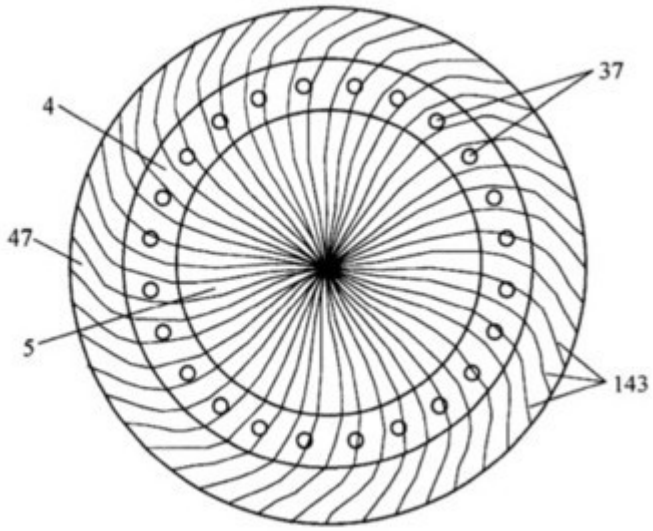


FIG. 14 shows a top or bottom view of a radial sector of the invention's neutral hull section, showing the housing cooling and/or heat transfer system arrangements.

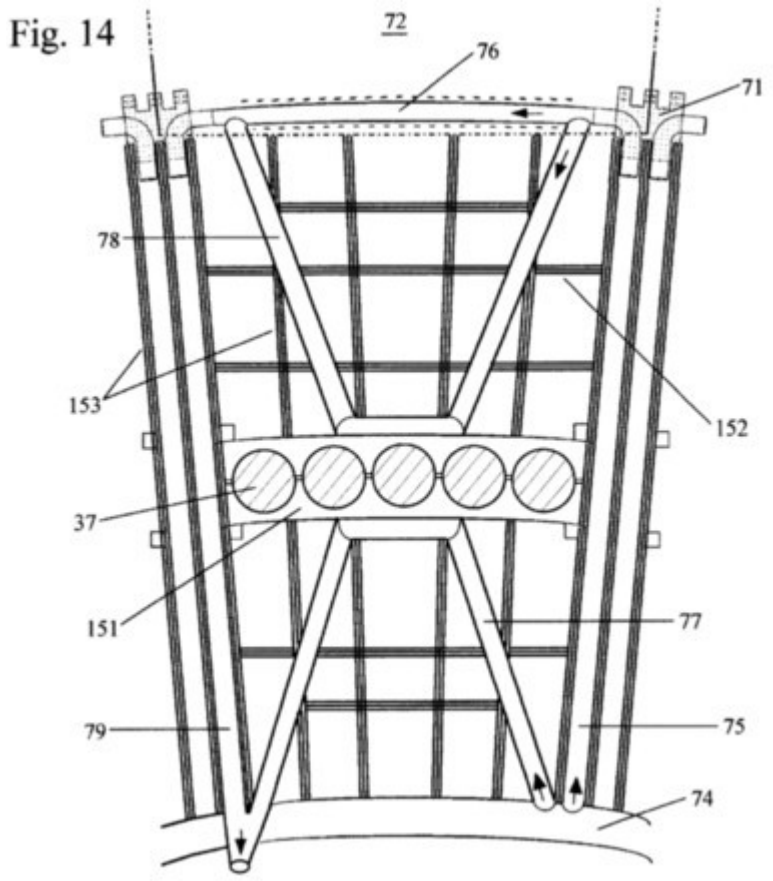


FIG. 15 shows a detail of an embodiment of the preferred central rotor segment attachment means and rotor drive assembly.

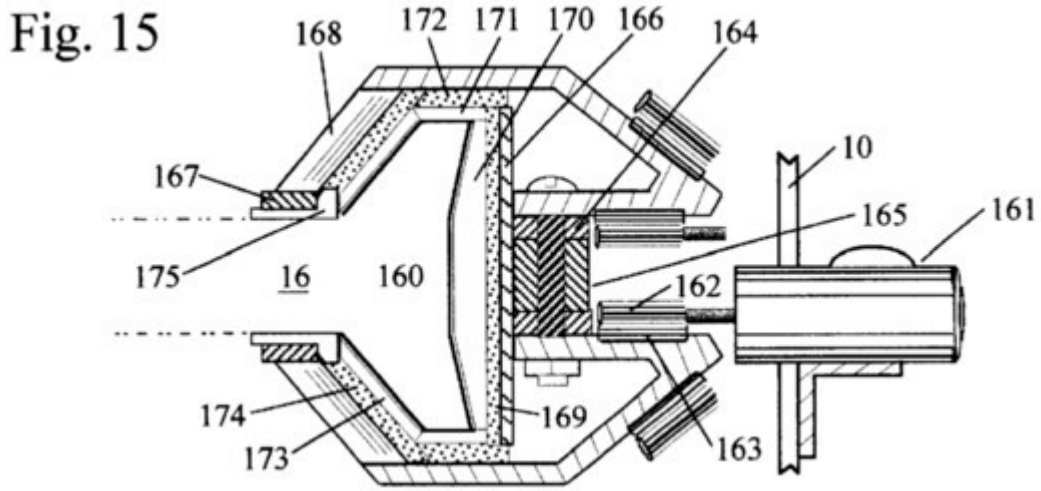
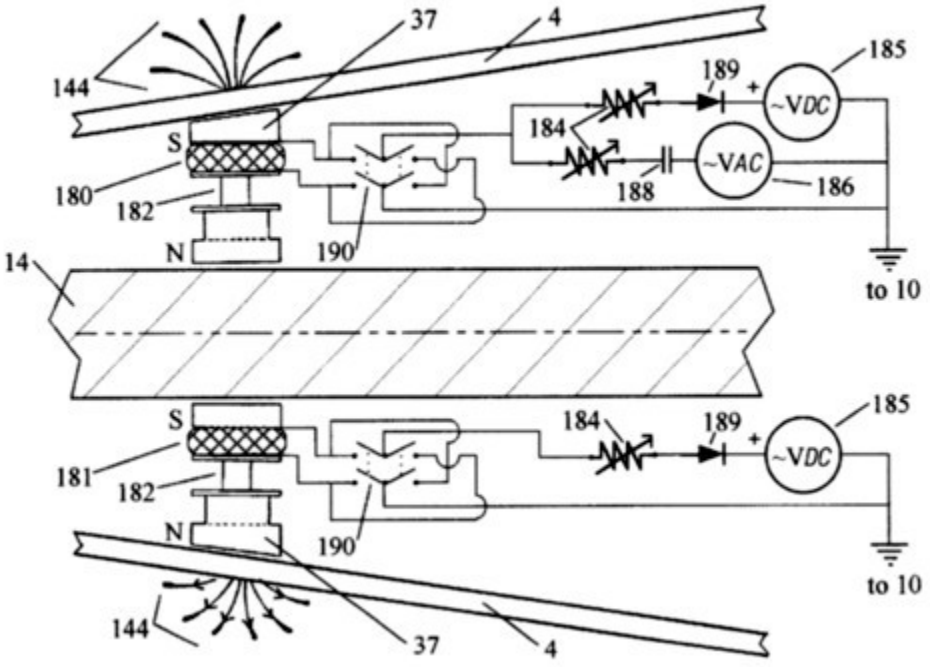


FIG. 16 shows a schematic of the stationary armature power circuit of the invention.

Fig. 16



DESCRIPTION OF THE PREFERRED EMBODIMENT

Method of Operation

The invention disclosed herein is an Electrodynamic Field ("EDF") Generator. The primary challenge involved in fulfilling the objects of the present invention is how to generate and maintain a multi-megavolt potential difference across the exterior sectional housing which is not immediately neutralized due to uncontrolled direct arc discharge. The first part of the problem in this respect is that it is not possible to produce this kind of voltage directly within a traditional generating coil arrangement, so the voltage applied to the charged housing sections must be achieved by special electrostatic means. Secondly, the discharge current must be produced and conducted internally in such a manner that: (i) only a tiny percentage thereof is actually conducted by the generating coils (within their very limited ampacity compared to that of the rotor); and (ii) the negative and positive housing sections are each charged faster than they are discharged until an enormous equilibrium field potential difference is established which is a sum of roughly equal negative and positive housing section voltages.

Having thus stated the principal parts of the overall problem, it is perhaps best to examine and explain the means to its solution in the reverse order. Therefore, it is deemed of fundamental import to realize that the EDF Generator's housing configuration as proposed will demonstrate a significant static capacitance, despite its unusual geometry, given the fact that the negative and positive sections of its housing are to have essentially equal surface areas. This simple precept ensures two very important consequences: (i) that the voltage across the housing will attain a value representing equal negative and positive potentials, in reliance upon the absence of a fixed ground reference, given induced surface charge densities which are sufficient to cause a continuous `leakage` current between the opposite-polarity sections thereof; and (ii) that a leakage current between the opposite-polarity housing sections will tend to assume a relatively

uniform cross section and current density in response to a calculable level of non-uniform surface charge density between non-parallel but equal-area `plates`. Thus, it is possible to determine using traditional formulas just how much electron charge must be stripped from the positive housing sections, and stored in ballast capacitors, in order to establish a positive surface charge density which corresponds to the desired housing or hull potential difference.

Next, the Generator must, and will, be able to charge these positive housing sections (by stripping them of native electrons) far faster than the positive surface charge so-created is neutralized by corona or arc discharge from the negative housing sections. Because these discharge current electrons will ultimately attain a transit time approaching zero, this in turn means that it must be "easier" per volt to strip negative charge from the positive sections--using a field induction system which is comprised of "primary electrode arrays"--than it is to deliver this charge to the negative sections across a vacuum chamber using relatively massive rotor-mounted field emitters.

It can be shown that the potential difference across said primary arrays will tend to be equal and opposite in operation as proposed to that across such vacuum chamber, in part due to the Faraday shielding principle, and the negative `plate` voltage of the capacitive housing will naturally tend toward numeric equality with that of the positive sections by electrostatic induction. Therefore, the stationary electron-emitting primary cathodes which link the positive sections of the housing to the rotor are to have a much lower surface work function (and higher emissivity) than the rotating electron-emitting elements which link the rotor with the negative housing sections. This criterion is achieved by thorium-impregnating these cathodes (to stimulate their emissivity) and by not so-impregnating the rotor field emitters.

The relationship just described establishes what electrical engineers refer to as an `instantaneous charge differential` with respect to these two sets of components as operated at equal but opposite charging voltages or potential differences, and the ratio of their respective electron emissivities will thus define the maximum ratio by which the said secondary field voltage (across the exterior housing) can be expected to exceed that in evidence across the stationary internal primary electrode arrays. This ratio will hereinafter be referred to as the "primary voltage expansion ratio", and the instantaneous charge differential concept as well as its relationship to the said voltage expansion ratio will be explained in further detail in a pertinent section to follow. It is important to note at this point, however, that for this voltage expansion to be realized it must and will be supported by ballast capacitors having suitable total capacitance as outlined hereinabove, which provide a corresponding force of electrostatic induction.

Finally, a method of impressing as large a primary DC voltage across the rotor as may practicably be developed in the device's principal generating system must and will be employed, without such "Primary Power System" circuit conducting more than a minute percentage of the discharge current thereby initiated. To do so, and in a manner that requires no brushes, vacuum tube cutoff bias technique is utilized in the present invention: whereby such primary voltage is electrostatically induced upon the rotor between two sets of capacitive electrode ring pairs (in vacuo), yet the current flow across these rotor-mounted induction electrode arrays--and through the principal generating circuit itself--is absolutely minimized by the application of a control grid voltage which is substantially negative with respect to the corresponding cathodes.

At a certain relative potential, the electrostatic force exerted by such control grid(s) on rotor circuit cathode-emitted electrons is sufficient to all but completely cut off the flow of DC current across these rotor induction arrays; yet the primary DC voltage is transmitted to the large conductive rotor segments such that a comparatively huge charging current between the

opposite-polarity housing sections is initiated and maintained (across the rotor)--which subsequently expresses the expanded secondary voltage as a discharge current about the housing. Thus, an analogy could be made in describing the EDF Generator as a DC equivalent for boosting voltage by electrostatic induction means to the AC transformer (for boosting AC voltage by electromagnetic induction means).

General Form of the Invention

Accordingly, referring to FIGS. 1 through 4, the present invention constitutes a novel form of brushless permanent magnet electrical generator for producing a useful ultra-high-energy external electrodynamic field, or continuous quasi-coherent DC corona or arc discharge of essentially uniform current density, and as such the Generator fundamentally comprises and incorporates:

[A] a flat conductive rotor (6) principally formed of a large number of evenly-spaced individual metallic conductors or segments (14) and an equal number of conductive electron-emitting elements or field emitters (17), radially arranged in an annular flywheel configuration rather like the rotatable deck of a carousel, which are all connected in parallel electrically by the attachment of a thin metallic electrode ring (68) about the positive inner circumference of each of the two major flat faces of the annular flywheel thus formed and by the attachment of another such ring (22) about the negative outer circumference of each such flat rotor face;

[B] a principal electrical generating system mounted on said rotor and used to create a very high primary DC voltage within a plurality of rotating toroidal field coils (35)(40)(56) by electromagnetic induction with an equal number of circular arrays of ring-shaped stationary permanent magnets (34)(39)(55) (which are positioned adjacent and concentric thereto), such that an internal primary discharge current may thereby be initiated between the rotor (6) and a housing electron "Emitter Ring" (47)--across an evacuated space charge chamber (11)--which is orders of magnitude larger than the operating current through said field coils;

[C] a conductive exterior housing (1) divided into a plurality of distinct electrical sections--negative (3), neutral (4), and positive (5)--which may be charged from the internal rotor by electrostatic induction and/or by such primary discharge current (as the case may be) and within an evacuated induction compartment (12) of which said rotor (6) as an assembly, including the said generating coils attached thereto, is rotatably mounted;

[D] a plurality of individual systems of stationary plane-parallel electrode elements (64)-(67) which electrically link the polarized rotor (6) by electrostatic induction about its positive inner circumference (within said evacuated compartment (12)) to two axially-central electron collector housing sections (5), and a plurality of similar individual systems of rotor-mounted plane-parallel electrode rings and/or radial electrode elements which may be utilized to connect a principal portion of the individual DC voltage outputs of said rotating field coils in opposed series-parallel across such composite rotor assembly;

[E] this composite rotor assembly (6) as a means for the transportation and capacitive storage of electronic charge between opposite-polarity sections of the housing (5) and (3) (which are proximal to the inner and outer rotor circumferences respectively), such that a vastly higher secondary voltage is caused to appear across interposed neutral housing sections (4), resulting in a continuous ultra-high-energy DC discharge current about the housing externally which is also conducted internally across the rotor segments (14) that extend across the neutral housing portion and between the positive sections;

[F] a large number of stationary electromagnetic armatures (37) in a uniform circular arrangement located within the neutral electrical region (4) of the housing which are to be operated principally on variable DC voltage, but which may also accept limited pulsed unidirectional or alternating voltage input, and which are employed as a group to impart an orderly rotational magnetic vector moment to the external discharge current that acts to inhibit the formation of concentrated arc streamer or channel phenomena and thus to assist in rendering such current quasi-coherent in nature; and

[G] the said principal electrical generating or Primary Power System as operated and used in such a manner that a minor pulsed unidirectional or alternating voltage is superimposed upon the high-energy DC rotor current, and the external discharge current therefore acquires a discrete AC power factor, for purposes of modulating the electrodynamic characteristics of the external field during normal operation and/or for purposes of exploring the invention's potential signal communications capability in relation to intriguing new theories in high-energy quantum physics and relativity.

In a "single-stage" rotor electrical circuit embodiment of the Generator, as intended for use in an electrical and/or thermal energy output application, any such minor AC voltage present in said rotor circuit receives only a modest and single level of amplification--in a manner generally associated with a single multi-electrode vacuum tube. In a "three-stage" rotor electrical circuit embodiment of the Generator, as intended for use in a propulsive and/or communications application, any such minor AC voltage may receive a substantial and multiple level of amplification--in a manner generally associated with a multiple number of sequentially-coupled multi-electrode vacuum tubes.

FIG. 1 shows a side sectional view of the general form of the invention, as if cut through the central axis of the circular structure. Only one side of the tapered peripheral portion of the structure is shown, the overall Generator being symmetrical about the axis along which the section shown is cut. FIG. 2 shows a top sectional view of the invention, as if cut through just above the rotor assembly at the "equator", with only about a 30.degree. radial sector of the circular structure shown (the remaining 330.degree. being identical around the Generator). In each case, identical reference numbers are used to indicate identical elements. FIGS. 3 and 4 are side and top or bottom views of the Generator (respectively), showing the outward appearance of the invention and the external field it produces. The following discussion of the general form of the invention will be in reference to FIGS. 1 to 4, unless otherwise noted.

The entire apparatus of the invention is contained within a circular conductive exterior hull or housing (1), which is tapered from its vertical centerline ("axis") to its rim (or "equator"). The overall housing is radially symmetrical around the axis, and bilaterally symmetrical about the equator. This housing's two central one-base spheric-zone-shaped sections (5) will be positively charged, its two intermediary conical ring-shaped sections (4) will be electrically neutral, and the convergent outermost or peripheral conical ring-shaped sections (3) will be negatively charged. Preferably, the surface areas of the outer (3) and inner (5) housing sections are equal, and specific details of the housing or hull design are given in a section to follow.

Each of the housing's two symmetrical positive sections (5), or hull positive "zones", should be divided into equal-area radial sectors (42) which are equal in number to the number of like sections into which the device's superstructure is divided. Thus, in the preferred embodiment of the Generator these two positive zones (5) will each be divided into 36 such sectors, and isolated top and bottom, yielding a total of 72 individually controllable discharge collector areas. The positive zone sectors (42) jointly comprise what may hereinafter be referred to as the device's

"Field Hub", and should be composed of a conductive refractory metal or high-temperature structural alloy such as #310 stainless steel. These positive sectors are insulated from sector-to-sector by insulating "partitions" (43) of a suitable ceramic material (such as Cordierite), and must be supported by an insulating understructure (not shown).

At least one hull "neutral ring" surface layer (46) is also to be affixed on a housing frame and composed of one or more insulating ceramic material/s (such as Cordierite, Zirconia, and/or Kezite, as necessary). Said neutral hull layer/s may be applied in the form of plates and/or tiles to nonmetallic "deck" sheeting (not shown separately) supported by superstructure beams (153). This decking and its supporting beams are both preferably composed of a carbon composite material, and will thus be fairly conductive. Therefore, both must be isolated from the positive Field Hub by a dielectric buffer material (45) and from the hull's Emitter Ring (47), comprised of two negative housing sections (3), by an auxiliary dielectric buffer (50). The Generator's neutral housing section superstructure is shown in detail in FIG. 14, as is a piping system of coolant tubes or "thermal conduits" (74)-(79) for maintaining the hull neutral sections (4) and superstructure--as well as the enclosed Primary Power System--at an acceptable operating temperature. Such an intercooler system would utilize a cryogenic coolant such as liquid air or nitrogen when the EDF Generator is operated in the atmosphere for purposes of thermal energy output, and will be explained in greater detail in a section to follow.

The negative hull plates which form each section (3) of the Generator's peripheral Emitter Ring (47), to which the rotor (6) distributes the discharge current forming the exterior field envelope, should be composed of high-purity aluminum which is copper-clad and then nickel-plated to prevent erosion at high field voltage and current levels. The abutting edges of all of the adjacent such plates must be welded one to another, and affixed to any necessary neutral hull section hardware, such that a hard vacuum may be drawn within the peripheral chamber (11) thereby formed. The induction compartment (12) enclosed between the two neutral hull sections (4) is contiguous with the peripheral or space charge chamber (11), and thus is equally evacuated.

A pressurizable central chamber (2) within the housing (1), located between the two hull positive zones (5) thereof, constitutes the location of the Generator's control cabin and of its payload area when used as an aerospace vessel. The interior (11)-(12) of the negative (3) and neutral (4) housing sections (respectively) is separately sealed, and must be as highly evacuated as possible to promote the efficiency of the various rotating and stationary electrode arrays and to prevent their destructive failure. The main vacuum seals (155) and the rotor's vacuum chamber charge buffers (156) are shown in FIG. 1.

Inside the evacuated induction compartment (12) of the housing (1), and surrounding the central chamber (2), is located the composite rotor assembly (6) in the form of a flat annular flywheel. In the preferred embodiment, 180 individual conductors or segments (14) of very high collective ampacity are employed in the rotor, as will be seen in the discussion of FIG. 5 below, as are a like number of inter-segment insulators or segment "separators" (16). The preferred material for the rotor segments is high-purity copper which is certified oxygen-free, to resist the production of free oxygen radicals at high operating temperatures which would degrade the performance of the various electrode arrays and cause an undesirable increase in vacuum chamber (11) temperature.

The inner ends of the rotor segments (14) and segment separators (16) are mechanically connected via a retaining and lockdown section thereof to one or more ring gear(s) (8), which run/s entirely around the central aperture of the rotor assembly. Suitable insulating attachment hardware (7), as described in detail in the following section (and shown in FIG. 15), will be used

to effect a rigid mechanical union of the segments and separators to the said ring gear(s) and associated drive means such that the gear(s) and all conductive components of such drive means are electrically isolated from the energized segments. The ring gear(s) (8) may be engaged by one or more pinion or drive gear/s (162) powered by a motor (9) or plurality thereof, which may be of various types (such as electrical or hydraulic), causing the rotor to rotate around the central chamber (2). The rotor is supported near its outer edge by two ballraces (25) mounted to the housing superstructure and to the rotor, and having bearing balls (26), allowing it to spin freely.

As can be seen in either FIG. 1 or 7, the rotor segments (14) are electrically connected together at each end by continuous inner (68) and outer (22) electrode rings, and also at intermediate points by induction cathode rings (28) and induction anode rings (61). The inner electrode rings (68) constitute the primary induction ring array anode elements, as will be described below. The outer electrode rings (22) are each covered by a dielectric layer (23) which is in turn covered by an anode ring (24), and each combination of rings (22) and (24) separated by dielectric layer (23) forms a housing charge ballast capacitor whose function will be explained in detail below. Induction anode rings (29) and cathode rings (59) are used to electrostatically induce corresponding negative and positive voltages on rotor-mounted rings (28) and (61), respectively, thereby electrically energizing the rotor segments as will also be described in further detail below.

FIG. 5 shows details of the basic rotor construction. Wedge-shaped ceramic pieces or segment separators (16) equal in number to the conductive rotor segments (14) are to be positioned uniformly between the individual segments, as are the rotor's peripheral field emitters (17). To form the base rotor construction, the segments, separators, and field emitters must be equal in number, preferably using 180 of each. The said segment separators are actually more structural than insulative in purpose, and not only stiffen the entire rotor to prevent its distortion at elevated temperature and rotational speed but also provide a nonconductive base for mounting all other rotor assembly components. Each of the ceramic separators (16) is bonded to its adjacent segments (14) by refractory adhesive layers (15).

Two important criteria for selecting a ceramic segment separator material are that the compound chosen be readily machinable like steel and provide very high physical strength yet require no firing. These parameters limit the choice made almost to a solitary substance: magnesium silicate (MgSiO.sub.3). When suitably formed, this material can be milled, drilled, and tapped like steel (using low-speed tungsten carbide tools) and approaches the physical strength of dry-pressed porcelain. It is ready for use directly after shaping and requires no kiln hardening.

This latter characteristic is very important as it is extremely difficult to produce fired ceramic pieces with the exacting dimensional control necessary in this case, and it eliminates the tendency of thicker fired pieces to develop micro-cracks which may potentially cause destructive failure of the component under high centrifugal loading. Surfacing can be done with abrasive paper or grinding wheels, and it is very important that this material be machined or worked perfectly dry as it is fairly porous and any lubricant used tends to significantly alter its dielectric properties. Magnesium silicate of this type is available from CeramTec NA as CeramTec designation AlSiMag 222, and will withstand constant working temperature of over 1300.degree. C.

The insulating separators (16) are shorter than the conductive segments (14), allowing for the field emitters (17) to be fastened outboard of the separators. The field emitters are thus located around the outer circumference of the rotor assembly and should be formed of a sintered refractory composite, such as tungsten-copper, selected for its relative surface work function and

superior arc-erosion characteristics. As can be seen in FIGS. 5, 6a, and 6b, the field emitters are fastened mechanically and electrically to the conductive segments (14) through locator pins (19), which fit into mating holes recessed into the ends of the segments. These emitters (17) taper to a somewhat rounded edge at the tips (20) which form the outermost periphery of the rotor (as an assembly), and are squared-off at their bases (18) to fit tightly against the insulating separators (16). From the top view of FIG. 6b, it can be seen that the field emitters follow the tapering of the segment separators (16), increasing slightly in width from their bases (18) to the tips (20). The conductive segments (14), in contrast, are of constant width over their length.

Overall Description of the Primary Power System Structure

Rotor Drive and Positioning Assemblies

Referring now to FIG. 15, a split-frame centrifuge-style carrier assembly reminiscent of the rotatable mounting arrangement for the turntable of a carousel may be employed to firmly suspend, center, and rotatably mount the composite rotor assembly about its inner circumference within the evacuated induction compartment of the housing, and such carrier assembly should preferably be constructed of a weldable nonmagnetic metal alloy which is suitably insulated from the electrically energized rotor assembly components.

The rotatable carrier assembly may be mechanically-affixed and/or welded to one or more large metal ring gear(s) which may be comprised of like sections (163) to facilitate construction and which in turn may be supported, driven, and dynamically braked by one or more low-voltage DC motor-generator unit(s) (161) (similar to those used in large electric trains) and drive pinion gear/s (162). Such ring gear(s) may additionally be supported by pinion gear and pillow block bearing assemblies (if necessary--not shown in FIG. 15). Such drive motor-generators(s) (161) and said pillow block bearing assemblies (if any) must be separately and nonrotatably affixed to the relatively stationary housing superstructure.

Referring still to FIG. 15, it can be seen that in the preferred embodiment the inner end of each rotor segment (14) and segment separator (16) is flared outward into a retaining "fantail" (160). These retaining fantails are preferably enclosed and prepared for connection into a driven assembly using a system of: [i] insulating inner (171) and outer (173) ceramic thermal spacers; [ii] axial (172) and radial (174) nylon (or equivalent) load buffers; and [iii] insulating displacement (170) and lockdown (175) ceramic bushings. The retaining fantails are then secured into a driven assembly by two identical carrier half-structures comprising frame struts and members (168) and retaining ring sections (167), using: [i] mounting ring sections (164) each having two ring gear sections (163) attached thereto; [ii] a corresponding number of mounting ring spacers (165) each having a very stiff metallic flexor plate (166) attached thereto; and [iii] nylon (or equivalent) torsion buffers (169). The drive pinion gears (162) allow a preferred total of 32 like and evenly-spaced DC drive motor-generator units (161), which are mounted to the Generator's ground frame (10), to apply input rotational torque (or counter-rotational braking torque) to the composite rotor assembly by engaging a total of four ring gears (comprised of sections (163)) which are mounted to the rotor's described drive carrier assembly.

Rolling bearing assemblies should be employed to further center and stabilize the composite rotor about its outer periphery within the evacuated induction compartment of the housing, as a readily feasible mechanical alternative for that purpose to `zero-friction` electromagnetic positioning systems (of the type normally associated with mag-lev train technology) which are of a much greater complexity.

Such rolling bearing assemblies may comprise two complimentary pairs of stationary and rotating circular-groove raceways (25) about the outer periphery of the composite rotor

assembly, as well as an appropriate number of bearing balls (26) including uniform ball separation means, and these bearing assemblies may be composed of nonmagnetic stainless steel and/or a specialized ball bearing ceramic (such as silicon nitride (Si.sub.3 N.sub.4)) which may run unlubricated in a very hot electrically-charged environment

The Rotor and Associated Elements

There are a number of electrical structures attached to the base rotor construction, which rotate with the segments, separators, and field emitters as a composite assembly. It will be understood that the structures mounted on the rotor and those interacting with the rotor are symmetrical above and below the incorporating device's equator, as well as either continuous or repeating in placement around the device in the plane of the rotor segments, so that a reference to an element at one point above the rotor also applies to the similar elements below and around the rotor.

Referring to FIGS. 1 and 2, and in the preferred three-stage embodiment of the invention suitable for an aerospace vessel (as shown schematically in FIG. 9), the following elements of the principal electrical generating means are mounted upon the annular rotor. Generally starting at the outer circumference of the rotor and working inward, and, for each structure, starting at the rotor and working upward, these are:

[a] the ballast capacitor, comprising a negative ring element (22) attached directly to the rotor, a dielectric layer (23) affixed thereto, and a positive ring element (24);

[b] the bearing ballrace (25), within which the bearing balls (26) roll between two identical raceway halves--one on the rotor, and one mounted to the vessel's stationary structural frame. The ballrace (25) and bearing balls (26) support the rotor peripherally and are structurally mechanical, not taking part in the electrical operation of the invention;

[c] the voltage-induction diode ring array, in the form of a cathode ring (28) which is mounted on and electrically connected to the rotor segments (14) and an anode ring (29) which is affixed plane-parallel to the cathode ring (28) and insulated from it by a suitable supporting structure using insulating posts, pins, or brackets in or on the segment separators (16). Although the resulting combination could be thought of as a 2-element or diode vacuum-tube construct and is similarly named, it is more accurately a "cold" parallel plate capacitor of high value and appreciable AC conductance which preferably exhibits a modest circuit DC leakage current;

[d] the outer field coil (35), helically wound and supported upon a continuous coil support or structural core which is preferably nonferromagnetic (not shown). There are preferably two windings on the core which together comprise such coil, as will be discussed in the circuit section below and as is shown in FIG. 9--the major portion or field winding (81), and a minor portion or bias winding (82);

[e] the outer voltage-transfer triode ring array, in the form of cathode (30), control grid element (31), and anode (32) rings or elements, affixed plane-parallel or radially-concentric above the rotor segments (14) and insulated from them and from each other by similar such supporting structure (using insulating posts, pins, or brackets) in or on the segment separators (16). This combination also comprises a triode vacuum-tube construct with controllably variable AC conductance;

[f] the center field coil (40), helically wound and supported upon a continuous coil support or core of the type described. There are again two windings on the core, as will be discussed in the circuit section below (and as is shown in FIG. 9)--the major portion or field winding (83), and a minor portion or bias winding (84);

[g] the inner voltage-transfer triode ring array, in the form of cathode (51), control grid element (52), and anode (53) rings or elements, affixed plane-parallel or radially concentric above the segments and insulated from them and from each other by the described supporting structure(s). This combination again comprises a triode vacuum-tube construct with controllably variable AC conductance;

[h] the inner field coil (56), helically wound and supported upon such continuous coil support or core. There are once again two windings on the core, as will be discussed in the circuit section below and as is shown in FIG. 9--the major portion or field winding (85), and a minor portion or bias winding (86);

[i] the voltage-induction triode ring array, in the form of an anode ring (61) which is mounted on and electrically connected to the rotor segments (14) as well as a cathode ring (59) and control grid element ring (60) affixed plane-parallel to the anode ring (61) and insulated from it and from each other by the said supporting structure(s). The resulting combination comprises a triode vacuum-tube construct with controllably variable AC conductance;

[j] the primary induction anode ring (68), which is also mounted on and electrically connected to the rotor segments (14) and which provides the positive element of the stationary plane-parallel electrode systems used to induce the exterior field; and

[k] the ring gear(s) (8) or other appropriate means for allowing a drive mechanism to spin the rotor.

Field Coils

Referring now to FIG. 1, the field coils (35)(40)(56) which comprise the major rotating portion of the primary DC voltage generating means are formed of conductive insulated magnet wire multi-layer toroidally wound upon cores (not shown) whose permeability should generally be minimized, and main portions of the DC voltage outputs of the three field coils comprising each of two like groups thereof--one above the plane of the rotor and one below--are sequentially connected via a plurality of individual systems of rotating plane-parallel electrode rings (or alternatively, modular radial electrode element systems or tubes) in the preferred three-stage rotor emodiment of the invention shown. The number of wire turns comprising each such field coil should in general be maximized (in a practical manner), in either the single- or three-stage embodiments.

As is depicted more clearly in FIG. 8, each such field coil may be compound wound or comprise two or more independent voltage generating portions, with either all or the major portion of each coil constituting the field winding (81)(83) or (85) or principal DC voltage generating portion of that coil as a whole, and the principal or field winding portions of the field coils comprising either of the said two like groups thereof may be hooked in series one to another by direct physical connection in the single-stage rotor embodiment of the Generator shown. Each of the two like sets of three such field windings thus formed are then connected on their respective sides of the rotor between the plate resistor (91) of the diode array anode ring (29) and the inner triode array cathode ring (59), while observing appropriate conventions of polarity assignment.

The remaining minor portion (if any) of each field coil may comprise one or more independent bias and/or control winding(s), or secondary DC voltage generating portion(s) of that coil as a whole, with the largest such secondary winding if any constituting the control grid bias winding of that coil. As shown in FIGS. 8 and 9, one such bias winding (82)(84) or (86) is provided for each field coil and is positioned in the schematic(s) immediately thereabove. In the single-stage rotor embodiment of FIG. 8, these bias windings are also directly connected in series one to

another between the inner triode array cathode ring (59) and the corresponding grid resistor (90) of that same array's control grid (60), with the negative end of each bias winding toward the said grid resistor.

In the three-stage embodiment of FIG. 9, the field winding of each said field coil is connected in series between the plate resistor (92) attached to the anode ring of the outerlying electrode system which is adjacent to that coil and the cathode ring of the innerlying electrode system adjacent thereto, while observing appropriate conventions of polarity assignment. The bias winding (if any) of each said field coil is then connected between the cathode element (30)(51) or (59) of such innerlying electrode system and the grid resistor (90) attached to the negative control grid (31)(52) or (60) (respectively) of that same electrode system, while observing appropriate conventions of polarity assignment, such that said bias winding is in parallel with the cathode ring or element of that electrode system and may therefore provide an AC and/or DC voltage bias with respect thereto in the manner associated with electron vacuum tubes.

Rotating Electrode Arrays

Electron vacuum tube design, construction, and operating methods are employed to impress the principal portion of each field coil group's combined series DC voltage output across the Generator's rotor in an opposed parallel arrangement (comprising two like field winding circuits or rotor subcircuits), such that the rotor segments become electrically polarized, although the rotor is not considered uniformly energized electrically until a finite DC Primary Power System circuit current is established against the series capacitance and high bias voltage of the several rotor-mounted electrode systems.

Two special pairs of highly-capacitive electrode rings (22)(24) seperated by a dielectric media (23) are affixed upon the polarized rotor (6) near the outer negative periphery thereof, and supplied with a portion of the Generator's positive primary DC output voltage, in order to accomplish the storage of a predetermined amount of ballast electron charge which is sufficient to enable a desired much-higher secondary voltage to appear across the neutral sections of the housing (given the static capacitance and surface charge density characteristics of the housing as a whole in operation).

Electron vacuum tube design, construction, and operating methods may be employed to induce and/or modulate a substantial DC bias upon the plate currents of any or all of the various rotating plane-parallel and/or radial electrode systems or "arrays" employed in the present invention. Each rotating three-electrode system or triode array so-employed should be constructed in such a manner that it exhibits a minimum design amplification factor (.mu.) equal to 4.0, with reference to any AC voltage or signal present in its electrical circuit and as a function of its engineered relative electrode spacing(s).

Electron vacuum tube design, construction, and operating methods may furthermore be employed to induce, modulate, and/or amplify a minor pulsed unidirectional or alternating voltage upon the high-energy DC rotor current, and therefore on the field envelope current as well, as a means by which the electrodynamic field produced by the Generator may potentially be used (as a form of antenna) for purposes of transmitting and receiving a variable electromagnetic and/or gravimetric resonant frequency signal either to or from itself or a separate similar device (as the case may be).

In light of this teaching, it is contemplated that one possible type of communications signal which might be investigated employing the EDF Generator would couple the electric, magnetic, and gravitic forces to utilize the wave mechanics of quantum potential vacuum fluctuations (.DELTA.E.sub.q /.DELTA.t), which are believed by some theoretical physicists to propagate at

c.sup.2 in order to explain the uniform operation of gravity and entropy in two space-time continuums which are coincident but completely out-of-phase. Should this quantum gravity theory prove correct, the transmission delay of a gravimetrically-coupled EM signal at this wave speed would be only 0.10525 seconds per light-year.

In any event, it should be noted that the rotor interstage coupling transformers (89) which are depicted in FIGS. 1 and 9 (but are not shown in FIG. 2) would be employed only in a preferred three-stage rotor embodiment, and mounted (one each) immediately above the rotating diode and transfer triode arrays ((28)-(29), (30)-(32), and (51)-(53) respectively). These transformers may preferentially take the form of continuous toroid coils on either powdered iron or nonmagnetic cores (like the field coils), having single-layer primary and secondary windings, or of one or more pairs of balanced toroidal arc-section coils and cores of similar composition which are uniformly distributed above said rotating arrays. Each transformer (89) uses two DC blocking capacitors (88).

It may be appreciated from FIGS. 8 and 9 that each bias winding or series group thereof, its associated triode array, and a corresponding output plate resistor (91) or (92) together comprise one stage of amplification of any AC signal voltage which may be present across that triode's grid resistor (90) as an input. In this way, electromagnetic waves of one form or another from outside the external field created by the Generator may be both detected, from their influence on the waveform(s) of the field envelope current, and amplified from within the device (when used as an aerospace vessel).

The Interaction of the Rotor and Frame-mounted Elements

Magnetic Rings

A plurality of circular arrays of stationary permanent magnets essentially comprise the stationary portion of the primary DC voltage generating means, and each such magnet is preferably to be formed as a C-shaped ring composed of axially round stock of a metallic ferromagnetic substance which exhibits a very high residual induction (such as the alloy family commonly known as Alnico). The number of individual magnetic rings comprising each such array should in general be maximized (in a practical manner). Preferably, each magnet array has a rigid and annular nonmagnetic round core (not shown) which is roughly equal in minor diameter to the inside diameter of the constitutent rings, such that the rings may be easily strung thereupon rather like beads on an abacus wire.

Referring once again to FIGS. 1 and 2, each of the several magnetic ring arrays (34)(39)(55) may be installed in sections which are preferably equal in number to the number of like sections into which the incorporating device's superstructure is divided. The rotating field coil (35)(40) or (56) associated with each such circular array of individual magnetic rings must be respectively concentric and adjacent thereto, and is basically positioned on both the radial and axial centerlines of the flux gaps of that array's constituent rings. As power is generated thereby, these rings may need periodic replacing.

The maximum length of the flux gap of each such C-shaped magnetic ring must of course be just slightly larger than the minor outside diameter of its associated field coil, and should be roughly equal to or just slightly less than the formed inside diameter of that magnetic ring. In the preferred embodiment these ring flux gaps are oriented horizontally, although they may also be readily oriented vertically if so desired. Each magnetic ring may also be mounted within the superstructure of the housing such that a comparatively small thin axially-polarized wafer of a highly-coercive permanent ferromagnetic substance (like sintered Ferrite 5 (BaO.6Fe.sub.2 O.sub.3)) is positioned in the hollow center of that ring magnet, with such wafer's magnetic poles

facing the like poles thereof, so as to act as a leakage flux blocking or reducing mechanism with respect thereto. These optional components would be most easily installed by insertion into a corresponding slot cut into each of the described mounting cores, and are recommended for use in very large devices.

Also arranged concentrically around the evacuated induction compartment (12) of the Generator, but fixedly mounted within the vessel's structure instead of rotating with the rotor assembly, are the following elements of the principal electrical generating means. Again, they are discussed in order from the outer circumference of the vessel inward, as shown in FIGS. 1 and 2, and a reference to an element at one point above the rotor also applies to the similar elements below and around the rotor:

[a] the stationary half of the ballrace (25);

[b] the outer array (34) of stationary permanent magnets, which should be mounted on a nonmagnetic core and in the preferred embodiment incorporates a maximum of 900 such ring magnets equally spaced around the vessel superstructure;

[c] the circular group of stationary electromagnetic armatures (37) or "variable inductor" array, as used to impart a rotational magnetic force upon both the external discharge current and the internal rotor assembly (which is proximal thereto). Each such array preferably comprises a maximum of 180 such armatures, and is to be approximately centered within the neutral region of the housing so that its constituent armatures are axially parallel to the rotor's axis of rotation;

[d] the center array (39) of stationary permanent magnets, which should be mounted on a nonmagnetic core and in the preferred embodiment incorporates a maximum of 720 such ring magnets equally spaced around the vessel superstructure;

[e] the inner array of (55) stationary permanent magnets, which should be mounted on a nonmagnetic core and in the preferred embodiment incorporates a maximum of 576 such ring magnets equally spaced around the vessel superstructure; and

[f] the stationary anode ring (58), located adjacent and plane-parallel to the rotating cathode (59) of the inner electrostatic-induction triode array, which develops an induced positive voltage that is made available to the control circuitry shown in FIG. 10 as described below.

FIGS. 8 and 9 show two embodiments of the Primary Power System. The "Field Induction System" or stationary plane-parallel electrode arrangement(s) employed to induce the exterior field is/are basically the same in either case, and the voltage control system of FIG. 10 may be used with either embodiment.

The simpler single-stage rotor system of FIG. 8 is primarily intended for applications wherein the EDF Generator would be employed to produce useful electricity or heat, the latter being extracted from a principal liquid hull coolant circulated through the primary thermal conduits (48) (shown in FIG. 1) that encircle the field power resistors (63). Two thermal exchange or main service manifolds (not shown) would provide ground-based support to such a Generator from an associated utility or physical plant, as well as a remarkable level of electrical or thermal output from such Generator thereto. Each such manifold would connect directly to a single circular center sector of one of the two positive housing zones. Each of these two center sectors (44), one or either of which is depicted in FIG. 4, must in this case be composed of a nonconductive material.

Description of the Primary Power System Circuit

Referring again to FIG. 8, the respective outer, center, and inner field windings (81)(83)(85) are directly connected in series, and the voltage thus generated is applied to the inner induction triode array cathode ring (59) and (through plate resistor (91)) to the outer induction diode array anode ring (29) and to the ballast capacitor anode ring (24). The respective outer, center, and inner bias windings (82)(84)(86) are also connected in series, and the voltage thus generated is applied between the inner induction triode array cathode ring (59) and (through grid resistor (90)) to the control grid (60) of that same array. This places said control grid in parallel with that cathode electrically.

The turns numbers of the bias windings (82)(84)(86) and the grid resistor (90) values are chosen to apply a bias voltage to control grid (60) such that the inner induction triode array is biased very nearly to current cutoff. This results in a very high voltage being induced on the rotor segments (14) between outer induction cathode ring (28) and inner induction anode ring (61), but at a very low series field coil current due to the near-cutoff bias of the triode array. It is expected that the voltage on the rotor segments between these two rings, in a preferred embodiment using this arrangement, would be approximately 8,000 volts for a four-foot diameter prototype, or about 2,000 volts per foot of housing diameter. It is also anticipated that series field coil current could be limited to fractional amperage in smaller such devices and to single-digit amperage in the largest.

The preferred embodiment shown in FIG. 9 is a three-stage rotor system which is considered to be much more useful for applications wherein the EDF Generator may be employed as an aerospace vessel, in that it allows energy/wave-function signals from outside the vessel to be detected and amplified in the manner previously described.

In this embodiment, instead of the field windings (81)(83)(85) being directly connected together in series, intermediary voltage-transferring triode vacuum tube constructs are used to effect an indirect series connection between the said field windings. The voltage thus generated is again applied to the inner induction triode array cathode ring (59) and (through plate resistors (92)) to the outer induction diode array anode ring (29) and to the ballast capacitor anode ring (24). The bias windings (82)(84)(86) are in this case used to provide an independent bias voltage to the control grids (31)(52)(60) of the outer, center, and inner rotating triode arrays, respectively, in parallel with their cathodes.

As in the single-stage rotor embodiment described above, the turns numbers of the bias windings (82)(84)(86) and the grid resistor (90) values are chosen to apply a bias voltage to control grids (31)(52) and (60) respectively such that each corresponding triode array is biased very nearly to current cutoff. This results in a very high voltage being induced on the rotor segments (14) between outer induction cathode ring (28) and inner induction anode ring (61), again at a very low or fractional current due to the near-cutoff bias of the triode arrays. It is expected that the voltage on the rotor segments between these two rings, in a preferred embodiment using this arrangement, would be approximately 1,500 volts per foot of vessel diameter.

In general, the stationary anode rings (58) and all of the rotating electrode rings except the primary anode rings (68) should be composed of a nonmagnetic structural nickel alloy (such as Inconel 600). All rotating control grid element wires should be composed of an alloy such as that commonly known as nichrome. The rotating cathodes may be composed of modestly-thoriated tungsten, however, if and only as necessary to establish a small DC Primary Power System current if the observed `dark discharge` current values are deemed insufficient, particularly in the three-stage embodiment wherein amplification of a minor AC signal voltage may be desired for communications purposes. The ceramic material Titania, with a nominal dielectric constant of

85, may preferably be used to form the posts, pins, or brackets which support the various rotating electrodes.

It is important to observe that both Primary Power System (rotor) field winding circuits as configured in both the single- and three-stage Generator embodiments will have an inherent AC series resonant frequency, and operation at that frequency will maximize the series field winding AC line currents (within given circuit resistor constraints) as well as the dependent stage plate voltage drops (across resistor(s) (91) or (92) respectively) which allow stage AC signal reproduction and amplification. As in traditional related practice, the series resonant frequency will be that at which the given circuit's inductive and capacitive reactances are approximately equal and opposite. Thus, the series resonant frequency of either of said Generator rotor circuit embodiments will be largely contingent upon the total field winding inductance and coil core permeability, as the various rotor electrode arrays and the plate resistor(s) (91) or (92) must have quite specific fixed relative design values of capacitance and resistance (respectively)--as a function of total field winding voltage--for proper overall DC and AC circuit performance.

Each Primary Power System control grid winding subcircuit as configured in the three-stage rotor embodiment may then be readily tuned for stage AC parallel resonance at the said inherent series resonant frequency, thereby minimizing stage grid subcircuit line current while maximizing the stage grid voltage drop (across each grid resistor (90)) which determines the level of net stage AC signal voltage gain or amplification obtained. As in traditional related practice, the parallel resonant frequency will once again be that at which the given subcircuit's inductive and capacitive reactances are approximately equal and opposite. This condition may be achieved by connecting an optional capacitor of suitable value if desired across the secondary winding (or control grid resistor side) of each rotor stage coupling transformer (89), as indicated in FIG. 9.

The Field Induction System

Before commencing a technical discussion of the stationary induction electrode systems which will be used to charge the positive housing sections, it will be necessary to further elucidate certain aspects of the Primary Power System electrical circuit so that a few of its key operational characteristics are more clearly understood.

Referring now to FIG. 7, each of the Generator's two identical groups of rotating field coils (one above and one below the rotor) are in essence connected in simple series across the rotor segments using pairs of capacitive electrode rings, thus forming a single series loop with respect to the rotor. The two such series loops are at the same time, however, connected in mutually-opposed electrostatic parallel with respect to the rotor segment circuit leg common to both such loops.

Based on applicable principles of proper circuit resolution and series DC capacitance, such an opposed series-parallel circuit may readily be configured such that equal and opposite-polarity voltages will result upon the rotor-mounted induction cathode (28) and anode (61) rings in the absence of a fixed ground reference. To this end, the rotor assembly itself is to remain completely without direct earth or chassis ground in operation, and a corresponding segment polarization will continue as the circuit is duly energized by a finite DC conduction current.

When a primary DC rotor current is also established to the housing's Emitter Ring (47) and an external discharge current in turn occurs to the positive zone sectors (42), the two systems of primary induction electrodes (64)-(68) also complete two simple series loops back to the rotor and the two such external field envelope subcircuits in parallel constitute the EDF Generator's "Field Induction System" circuit. Thus, the total field discharge current equals the primary rotor

current, and the rotor segment circuit leg is common to both of the major system circuits described.

As is apparent from the section on Method of Operation, it is imperative that the charged housing sections also have no direct earth or chassis ground, being instead of a `floating-ground` reference with respect to the described primary rotor circuit. The cathodes (64) of these two primary electrode systems may have a chassis ground reference at a very high resistive bias (as indicated in FIG. 10), across which any actual cathode charge imbalance or potential in operation may be detected and measured.

Therefore, in light of the Faraday shielding principle and the said equal and opposite voltages which occur at opposite ends of the rotor segments (14), the potential difference between the rotor field emitters (17) and the inner surfaces of the two negative hull sections (or Emitter Ring (47)) will tend to become equal (and opposite) in operation to that across the primary electrode systems. And thus, a suitably vast and engineered differential in the electron emissivity of the field emitters (17) and the said ground-referenced primary cathodes (64) will define the primary voltage expansion ratio which may be obtained (in the manner first outlined in the section on Method of Operation). This topic will be discussed in more detail in a section to follow.

Moreover, a basic field-envelope-circuit generator design is disclosed which thus far, in accordance with Faraday's and Lenz's Laws, can produce a very high DC primary voltage with minimized circuit AC current inductance losses. The Primary Power System's DC voltage is not readily available, however, for purposes of normally-usable electrical output. Brushless electrode rings (58) must once again be employed to extract any portion of this primary voltage for off-rotor use. The Primary Power System schematics shown in FIGS. 8 and 9 in conjunction with FIG. 10 best illustrate the use of these two additional stationary anode rings (58), one suspended adjacent to each inner rotor induction cathode ring (59), which allow a large electrostatically-induced positive DC voltage to be `picked off`. This positive voltage may then be used as a source of low power within an external circuit, provided that circuit is negatively-grounded and only to the Generator's chassis, and is therefore really intended for auxiliary onboard usage only.

It can be seen thus far, and especially in FIG. 7, that there are essentially two major systems involved in creating the voltages which must be applied to the positive and negative housing or hull sections in order to form the electrodynamic field that will surround the Generator in operation. These two systems are:

[A] the Primary Power System, which generates a large DC voltage by electromagnetic induction and then electrostatically induces a major portion of that voltage upon the rotor segments (14) between two pairs of induction anode (61) and cathode (28) rings which are conductively affixed thereto (about the inner and outer circumferences of the rotor assembly, respectively); and

[B] the Field Induction System, which utilizes the potential difference which then exists between the positive inner circumference of the rotor--and its two attached primary anode rings (68)--and two separate sets of highly electron-emissive stationary cathodes (64) which are maintained at chassis ground and which are circularly-arranged near and electrically-connected to the periphery of each central collector housing section (or "zone") so that they may jointly charge their respective zone sectors (44) and/or (42) positively by stripping them of native electrons.

Each of these primary electrode array cathodes (64) connect directly to a field power resistor (63), which in turn connects to one positive radial zone sector (42) of the central housing sections. Each such cathode (64) is also vertically aligned inboard with a group of three stationary plane-parallel grid electrode elements and one of the two innermost rotating induction anode rings (68) conductively-affixed to the rotor segments (14) (about their positive inner

circumference). Each such group of three grid elements is comprised of a control grid (65), an accelerator grid (66), and a suppressor grid (67), with one such combined grid element assembly per radial zone sector (42).

Together with the said primary induction anode ring (68), each such 5-electrode group constitutes what is termed a "unit pentode array" ((69) as seen in FIG. 7). The unit pentode arrays (69) and their associated frame-mounted power resistors are thus arranged in two ring-shaped sets, located between the rotor and the two positive housing sections, which are referred to throughout as the "primary induction ring rays".

The potential difference between the unit pentode array cathodes (64) and rotor primary anode rings (68) is then referred to as the "primary array voltage", as the unit pentode arrays of each primary induction ring array are connected in parallel electrically (between the field envelope and rotor), and the number of unit pentode arrays should be equal to the number of like sections into which the Generator's superstructure is divided.

Electron vacuum tube design, construction, and operating methods may be employed to induce and/or modulate a substantial DC bias upon the plate current(s) of the several unit pentode arrays, which electrically link the polarized rotor to the central housing sections, for purposes of rendering the external electrodynamic field variably non-isometric and therefore directionally propulsive. Each such "stationary" 5-electrode system or unit pentode array (69) (whose anode element actually rotates) should be constructed in such a manner that it exhibits a minimum design amplification factor (.mu.) equal to 12.0, again with reference to any AC voltage or signal present in the Field Induction System circuit and as a function of its engineered relative electrode spacing(s).

The rotating primary induction anode rings (68), stationary cathodes (64), and various grid element wires which are associated with the stationary multi-electrode systems should be composed of tungsten, due to the extremely heavy conduction current across these primary arrays. Ceramic posts, pins, or brackets composed of a specialized material such as Titania may once again be used to support all of the various stationary electrodes and grid elements, and each unit pentode array's grid wires should be vertically aligned (or mutually-shading) similarly to those in a "beam power pentode" vacuum tube.

As generally depicted in FIG. 1, a primary thermal conduit (48) with an imbedded coolant-carrying core (49) encircles and mechanically supports each unit pentode array, its power resistor (63), and that resistor's enclosing dielectric buffer (45). These thermal conduits and dielectric buffers will be examined in further detail hereinafter.

The operation of the Field Induction System is regulated by a central Field Voltage Control System which is modular in nature, as illustrated in FIG. 10, and which is therefore mechanically and electrically connected to the stationary cathodes and grid elements of each unit pentode array (69). In this regard, the auxiliary stationary anode rings (58) described above are to serve as the source of positive voltage applied to the accelerator grids (66) of said unit pentode arrays, and such Field Voltage Control System is designed to directly accept this voltage for that purpose. The Field Induction and Voltage Control Systems will be discussed further in sections to follow.

Zone Sector Construction

Referring now generally to FIGS. 3 and 4, one major goal in dividing each of the two hull positive zones or sections (5) which jointly comprise the Generator's Field Hub into a large number of radial sectors (42) in electrical parallel is to limit the external field current reaching each particular power resistor and unit pentode array combination to a fairly uniform level, while

somewhat reducing field current return eddy losses as well. However, each radial sector (42) is thereby also given the capability of effecting a local thrust production differential (in propulsive three-stage rotor devices), by virtue of its electrical isolation, as it is then possible to vary the local resistance presented to the electrodynamic field with respect to any given radial sector so that a substantial measure of navigational control in the z-axis may thus be achieved by varying the proportional field current conducted by that sector.

Because the inherent resistance of each such sector itself will be negligible even at an extremely elevated operating temperature, in part due to the very low temperature coefficient of resistivity of the proposed steel hull plate material, the voltage drop across the radial length of each sector will also be negligible. Thus, the determination of an appropriate sector thickness becomes an entirely structural consideration. A secondary design goal with respect to zone sectorization is therefore to select a uniform cross-sectional area for the radial zone sectors (42) which yields a Field Hub total conduction mass approaching that of the device's rotor segments (14).

The hull plating which forms each positive zone (or section (5)) of the Generator's Field Hub should preferably be composed of stainless steel or a refractory metal, and divided into thirty-six equal-area radial zone sectors (42) of truncated wedge shape and a circular center zone sector (44). As stated earlier, in the single-stage Generator embodiment these two center zone sectors must be of a nonconductive material or construction, and should also comprise approximately 4 to 5% of the total area of their respective zones to allow the connection of the exchange or main service manifolds described above. In the three-stage embodiment such center sectors (44) must instead be conductive as just prescribed for the radial zone sectors (42), and should each comprise about 1% of the said zone area. Each such positive radial sector should be formed of a single piece of the hull plating material in such a manner that its cross-sectional area in the direction of its radial length is maintained at a very uniform value.

The uniform thickness of each center zone sector (44) should be equal to that of the radial sectors as measured at the minor (inner) arc width thereof, and the radial sectors must be insulated from the respective center sector where they meet that center sector's periphery (except in single-stage rotor devices). A suitable thin ceramic insulating partition (43) may therefore be installed between each adjacent pair of radial zone sectors (42), and around each center sector (44) in three-stage devices, and the uniform flat thickness of these sector insulators should in general be minimized.

In three-stage devices, four radial sectors (42) of each positive housing zone which correspond to cardinal points separated by 90 degrees of the hull's circumference, and which divide the Field Hub into four equal quadrants (as indicated with phantom lines in FIG. 4), should be connected in parallel with the center sector of that positive zone at the maximum positive voltage end of those four sectors' respective power resistors (63).

The parallel resistance of the four conductors which therefore connect each center zone sector (44) (in three-stage devices) to its respective network of power resistors should then be such that that sector's per unit surface area level of field current conduction is slightly higher on the average than that of its adjacent radial sectors (42), under uniform zero-signal field bias conditions as hereinafter described.

The four unit pentode arrays (69) of each primary induction ring array which correspond to the power resistors so-connected to that primary array's center zone sector (44) would generally not be utilized individually in the active field current bias modulation related to the production of local thrust differentials (in three-stage rotor devices), being instead reserved primarily for potential involvement in signal communications transmission and/or reception activities.

Power Resistors

As best seen in FIG. 1, the cathode element (64) of each plane-parallel electrode system or unit pentode array which is used to link the rotor assembly with a positive housing collector section or radial zone sector (42) is electrically connected to such positive section or sector by means of a ceramic resistor block (63), of a certain low dielectric constant and high volume resistivity, which becomes a poor but effective conductor at the elevated operating voltage and temperature of such housing collector sections and which ensures an adequate external field current voltage drop between such section or sector (42) and said cathode element (64) (which is chassis-grounded as shown in FIG. 10).

Referring still to FIG. 1, each said ceramic resistor block or "power resistor" (63) is to be entirely jacketed by a hollow ceramic thermal conduit (48), including a dielectric buffer (45) composed of a ferroelectric material having a certain high dielectric constant and very high volume resistivity which does not become a conductor even at the elevated operating voltage and temperature levels of said power resistors. These thermal conduits (48) mechanically connect the power resistors to a flattened inner surface of such positive hull section or radial sector (42) and a form of very-high-temperature heat transfer fluid such as liquid sodium may be circulated therein so that the proper resistor temperature is maintained to ensure an optimum cathode potential with respect to ground.

A suitable manifolding, pump, and heat exchanger system (not shown) may be used to extract or transfer an extremely high level of recoverable thermal energy from the power resistors (63), arising from the field current voltage drop associated therewith, by means of such primary heat transfer fluid circulated through the thermal conduit cores (49) in the manner normally associated with nuclear power plants. Similarly, the rate at which such primary hull coolant is circulated may be used to directly regulate and limit the external field current to a value within the safe ampacity of the rotor assembly.

It is important to point out that each of the Generator's power resistors (63) and its associated dielectric buffer (45) and primary thermal conduit (48) may be designed, as an assembly, to incorporate a fixed positive reduced-voltage tap (not shown), whereby a main source of onboard or output DC or AC electrical power may be provided either for or from the Generator within a limited-duty circuit which is grounded directly to the primary cathodes. Provisions should and may also be provided for biasing, damping, and/or inductively coupling any primary conduit connecting sections, to control or harness electromotive currents induced in the highly-conductive primary coolant. Onboard electrical resistive heating means should and may be incorporated for purposes of pre-heating the primary coolant and, in turn, the power resistors and dielectric buffers.

Referring briefly to FIG. 11, it is also important to note that the Generator's power resistors must be in a conductive state before the housing potential difference reaches breakdown field intensity, as figured along a minimum semicircular arc trajectory (142) across the hull neutral sections (4), and the flow of field discharge current commences. Therefore, the actual maximum dielectric constant of the resistor material used in very-high-voltage single-stage rotor devices, and in ultra-high-voltage three-stage rotor devices as well, may be calculated at about k=11.

As is best seen in FIG. 14, the recovery thermal conduits (79) of the secondary hull coolant system which assist in supporting the entire tapered peripheral portion of the housing must pass inboard between the power resistor assemblies referred to above, and therefore the resistors (63) must assume a complex tapered shape to provide the necessary clearance. As generally depicted in FIGS. 1 and 2, they will have a trapezoidal cross section at the `top` or outward-facing end

(with radial length somewhat greater than minor circumferential width) and a rectangular cross section at the bottom or cathode end (with circumferential width much greater than radial length). In this regard, their engineered shape should still maintain a uniform conduction cross section exactly analogous to that of the preferred positive zone sector construction described above.

Dielectric Buffers

Referring once again to FIG. 1, it is imperative to electrically insulate the power resistors (63)--due to the extreme voltage drop that will occur across them in operation--to prevent direct discharge to other nearby structural components from taking place. However, not only is this a problem due to the thickness of insulation which would be required at any `ordinary` dielectric value, but the power resistors' projected operating temperature range of 600 to 700+.degree. C. completely precludes the use of almost all known dielectrics. Fortunately, the search for high-temperature dielectrics for use in aerospace electronics applications (particularly multi-layer capacitors) has resulted in the development of a small number of exotic materials potentially suitable for use as a space charge buffer (156) or dielectric encapsulant (45) for the Generator's power resistors (63).

In the application contemplated herein, the volume resistivity of the resistor encapsulant is somewhat secondary to its dielectric constant k at high temperature, because no opposing contact voltage is present (as in a capacitor) to encourage circuit conduction losses within the material. Therefore, the prime consideration is the dielectric's ability to exhibit a very large k value at over 600.degree. C. This places the material squarely in the realm of a very small select group of Class III high transition temperature ferroelectrics. These materials, such as Tantalum-modified Lanthanum Titanate and Lead Ytterbium Tantalate, do not begin to demonstrate significant dielectric strength at less than 300 to 450.degree. C. One such compound, Sodium Bismuth Titanate (Na.sub.0.5 Bi.sub.4.5 Ti.sub.4 O.sub.15), actually exhibits an amazing peak k value of about 3100 near the middle of the said power resistor operating temperature range: at 655.degree. C. (1,202.degree. F.). This would seem to indicate that this compound is eminently suited for use in forming the necessary rotor space charge buffer pieces (156) and/or resistor dielectric buffers (45) in this application.

It should be stressed that great care in quality control must be exercised in formulating and sintering this or any similar such special compound during manufacture of the dielectric buffer pieces. An absolute minimum of impurities must be assured, the density of the constituent powder maximized, and each piece finally certified as being free of the smallest physical defect prior to use in order to attain the desired operating performance. It is also hoped that these crucial components may each be compaction die formed and sintered simultaneously with a respective power resistor (63), and perhaps even with the corresponding primary thermal conduit (48) as well.

The core (49) of the thermal conduit associated with each power resistor (63) should be constructed of a refractory metal or alloy tubing (such as molybdenum) which is jacketed with high-purity Alumina or a comparable material formed directly thereupon. Thus, each such primary thermal conduit becomes an extremely strong structural member which may also be used to support the stationary electrodes of the corresponding unit pentode array, while circulating the preferred liquid sodium heat transfer fluid or coolant around the outward faces of that power resistor to recover or remove its excess heat.

Each power resistor (63), its dielectric buffer (45), and associated primary thermal conduit (48) together comprise one power resistor assembly, and each such assembly in combination with its

corresponding unit pentode array is considered for present purposes as forming the constituent component group of which the primary induction ring arrays and Field Induction System are comprised.

Extensive calculations reveal that a suitable power resistor material in most sizes of the single-stage embodiment of the Generator would be a ceramic material with the chemical formula Mgo.SiO.sub.2, which is available from CeramTec NA as CeramTec designation Steatite 357. A suitable power resistor material in most sizes of the preferred three-stage embodiment of the Generator would be a somewhat different ceramic material with the chemical formula 2MgO.2Al.sub.2 O.sub.3.5SiO.sub.2, which is available from CeramTec NA as CeramTec designation Cordierite 547.

Overall Description of the Field Induction System Circuit

Before an overview of the EDF Generator's Field Induction System electrical circuit is presented, a somewhat comprehensive examination of the nature of the housing or hull configuration should be made, as in this application the hull itself is an active part of that circuit. Its electrostatic characteristics as a function of such configuration will therefore have a fundamental influence upon the nature of the external field envelope discharge current itself.

Hull Design

The derivation of the Generator's design hull configuration, as best seen in FIG. 3, comprises a long and complicated story. This should not be taken to imply that the final and rather exacting composite shape selected is the only one that `works` properly. It merely reflects the preferred embodiment of the inventor's conceptualization of a fundamentally mechanical device which happens to entail both tremendous electrical complexity and inspiring aeronautical implications.

Should the proposed vessel eventually be used to explore the possibility of transcending the time/light barrier, extremely precise calculations regarding its spatial displacement and charge/mass ratio will no doubt become necessary. Therefore, one of the principal reasons for the chosen hull design is that the total vessel displacement may readily be calculated using traditional formulas from analytic geometry for the volumes of the two truncated right conic sections and two one-base spheric zones, and the volume of the remaining cylindrical central chamber region.

Using just these formulas, a vessel hull configuration has therefore been developed which may be linearly expanded (as a scalar function of the hull radius) to virtually any size with no significant loss of accuracy. The Table of Dimensions which follows and the attendant schematic hull diagram of FIG. 3, upon which all of the subsequent Detailed Calculations quoted are based, illustrates the application of this design technique to a theoretical vessel hull only 48" in diameter. It must be emphasized that the construction of an Electrodynamic Field Generator this small might not prove entirely practical in reality, due strictly to mechanical limitations, and the inventor believes this prototype model to be in fact the smallest such machine that could be built. This original hull size was deliberately selected, however, to encourage the development of the maximum possible accuracy with respect to contingent specifications for the relative size and positioning of the Generator's principal components, prior to the actual construction of larger machines.

The surface areas of the negative (3) and positive (5) hull sections are set equal to each other, and for two very important reasons: [i] to give the vessel hull a significant theoretical capacitance (despite its unusual geometry); and [ii] to render the two "driving" or discharge current portions of the field envelope uniform in cross section. Essential considerations which

are related to these fundamental design criteria are best expressed in the following electrostatic formula for uniform field intensity in a DC capacitor which exhibits a continuous leakage current:

where V = equilibrium potential difference in volts,

.sigma. = average surface charge density of one plate,

d = plate separation in meters,

.epsilon..sub.o = universal electrostatic constant,

and E = uniform field intensity in volts/meter.

This equation plays an important supporting role in the invention's Method of Operation, as previously discussed in that section above.

The volumes of the peripheral right conic sections of hull volume surrounding the Field Hub and and those of the one-base spheric zones comprising the Field Hub itself are also set equal in a preferred embodiment, as this criterion is postulated to promote both the structural integrity of the hull in any attempt to breach light speed (and establish a stable Kerr metric space warp about the vessel) as well as the gravimetric stability of the central chamber/cabin area in light of the relativistic mass effects involved while doing so.

As the case may be, to achieve this equal-area/equal-volume design, it was found necessary to employ two crucial interrelated constants (in addition to the ratio 1/5 used to radially "step off" the hull's interior space): the Hull Area Constant and the Polar Hull Constant. The Area Constant is (as the name implies) necessary to achieve the equal-area part of the overall design solution, and merely dictates the small deviation of the neutral (4) and negative (3) housing sections' ring radii from the stated preferred design increment of the hull's radial width.

The other requisite design factor, the Polar Hull Constant, is much more complex in nature. This value specifies the maximum height of the spheric hull zones (5) as a function of their arc-shape, and the corresponding contingent Polar Volume Differential is absolutely essential to achieving the equal-volume aspect of the preferred design. It is important to note that certain allowances must be made in practice for a finite but electrically-significant peripheral edge `thickness` (and therefore surface area) at the equator of the device's negative housing Emitter Ring (47), but will in general only minimally modify the "pure" design-model values obtained using the mathematical formulas given in the Table of Dimensions to follow.

Hull Configuration

Referring now to FIGS. 3 and 4, the exterior housing or hull (1) is designed specifically to have a circular disc shape the thickness of which along the vertical axis of symmetry (that also constitutes the rotor's axis of rotation) is relatively minor as compared to the diameter along its radial centerline plane, and which tapers gently from a maximum thickness along such vertical centerline to a very minor thickness at the radial periphery (47) of the housing.

The tapered disc shape of the hull is postulated to promote the formation and maintenance of a stable bihemitoroidal corona or arc discharge field based upon certain empirical principles of electrostatics and upon laboratory experiments performed by the inventor involving concentric circular electrodes. Such an electrodynamic field may be characterized electrostatically in this application by an axial positive polar electric field contiguous with a biplanar negative electric field, with each field of one given polarity tending strongly to become oriented parallel to a field of opposite respective polarity but similar intensity.

The exterior housing or hull (1) is therefore divided into two axially-central positive electron collector sections (5), as well as: [i] either a single radially-peripheral negative electron emitter ring (47) which is biplanar in cross section or two or more such ring sections (3) which are uniplanar in cross section having separate planar orientations; and [ii] two dielectric neutral sections (4) which are interposed between said positive and negative sections such that each such section of a given polarity is spatially separated from each section of the opposite respective polarity.

The total external surface area of the housing's negative Emitter Ring (47) or sections (3) is essentially equal to that of the positive collector housing sections (5) or zones, such that the overall housing configuration thereby acquires a significant theoretical static capacitance by design as intended. An estimated base value for such hull capacitance `C` may be obtained by applying the surface area `A` of the hull's two sets of "plates", as figured using the formulas in the Table of Dimensions below, to the standard formula for parallel-plate capacitance (C=.epsilon..sub.o A/d). When plate separation `d` is taken to be the simple average of the longest (141) and shortest (142) purely-semicircular arc current trajectories across the hull, as depicted in FIG. 11, this estimate of hull capacitance is approximately 13 to 14 mmf for an EDF Generator 48" in diameter.

Field Composition

Referring to FIG. 11, the external discharge current once initiated may be expanded as a function of the operative field voltage to fill two hemitoroidal spatial volumes of rotation (140) whose outer perimeters (141) are defined by a semicircular electron arc trajectory across the full housing radius in a plane perpendicular to the housing surface, or from the outermost point on the negative periphery thereof to the respective positive centerpoint of the housing lying on the vertical centerline thereof, and whose inner boundaries (142) are defined by a similar such trajectory across the hull's neutral ring or sections (4) from any innermost point on the negative periphery to the closest point thereto lying on the respective positive collector section (5).

The physical volume (140) of the external discharge current as described has a uniform cross-sectional area in the radial direction of electron conduction which corresponds to any such semicircular arc trajectories between points on the housing's negative Emitter Ring (47) and the respective positive collector housing sections (5) and therefore, by the definition of a conductor, such discharge current must assume a uniform current density. While very difficult to effectively describe in verbal terms, the idealized mathematical configuration of the Generator's heat- and thrust-producing field envelope region (as a function of its housing geometry) is visually easy to grasp and is clearly illustrated in FIG. 11.

As indicated in FIGS. 12 and 13, stationary electromagnetic armatures (37) are uniformly distributed into two circular arrays (145) containing equal numbers thereof which are positioned on opposite sides of the rotor from one another, and which are each located concentric to the rotor's axis of rotation midway between the negative Emitter Ring (47) and positive housing sections (5). These armature arrays (145) may be employed as two separate groups to impart a holistic but attenuating rotational magnetic vector moment upon the external discharge current, reaching through the thin neutral sections (4) of the housing, and thus may be used to modulate the field envelope's kinetic and electrical characteristics in a variety of ways useful to the invention and its objects.

FIGS. 12 and 13 also show the electric field vectors (143) as described above, and magnetic field vectors (144) as produced and modulated by the armatures (37) comprising the two armature or variable inductor arrays (145). FIG. 13 specifically depicts the regular lateral bending or

displacement of the radially-impinging electron trajectories (143), under the influence of the inductor arrays (145), which is postulated to have a unitizing effect on the driving portions (140) of the field envelope.

It can therefore be seen that the device contemplated herein may be operated in such a manner that its external breakdown discharge current field achieves a uniform conductive cross section and current density, as well as a holistic and orderly rotational aspect which subsequently acts to assist in rendering such current quasi-coherent. And thus, for purposes of this device and its applications, such a discharge current field should be thought of as a special qualified type and form of DC corona or arc discharge--having significant propulsive potential (to be further examined)--which then merits technical description as an electrodynamic field.

In this respect, it may for now be emphasized that a useful level of electrically-developed thrust may be realized from the relativistic impulse of the electrodynamic field current electrons incident upon the positive collector housing sections and, postulating the operation of the device in the vacuum of space (with a physical field current volume as described), the impulse velocity of such incident field electrons may be raised to as high as 99.99% of the speed of light and more with the corresponding relativistic mass thereof then equal to 69 times their rest mass or indeed much more.

Primary Voltage Expansion Ratio

In keeping with the logic presented at the opening of the Field Induction System section above, the primary array voltage will tend to equal only one-half (1/2) of the DC voltage expressed across the rotor segments (or "rotor voltage"). Therefore, to develop an extraordinary multi-megavolt `secondary` or field voltage across the Generator's housing of the type just described, the primary array cathodes' electron emissivity (expressed as a certain factor) must exceed that of the rotor field emitters by a ratio which is at least as large as the ratio of the desired field voltage to half the observed said rotor voltage. The latter such ratio is then thought of as the primary voltage expansion ratio in this application, as outlined in the Method of Operation section hereinabove.

A difference in the instantaneous rate at which these two said sets of parts will tend to discharge under the impetus of a given equivalent voltage or potential difference is thereby created. This instantaneous charge differential enables the primary cathodes to strip native electrons from the positive housing sections (5) thousands of times faster than such charge can reach the negative emitter housing sections (3) from the rotor field emitters. Thus, an instantaneous charge differential is perhaps best described as a cumulative charge imbalance that is known to operate (under certain conditions) in capacitive and/or thermoelectric circuit arrangements and to express itself as an elevation of the applied voltage or potential difference therein.

To actually achieve and support such a condition requires the use of two housing charge ballast capacitors whose negative `plate` elements or rings are affixed directly to the rotor segments (about their outer perimeter) and which are immediately able to store an amount of such charge that is sufficient to produce equilibrium collector surface charge densities resulting in the desired field voltage. This average required housing charge density is calculated using the traditional formula given in the Hull Design section above.

The voltage applied to the positive rings of these ballast capacitors is taken from the rotor's outer field coil anode ring connections and therefore represents a large portion of the Primary Power System's generated field winding voltage. It should be noted that this voltage must actually be passed to such capacitors beneath the rotor ballrace assemblies in the form of recessed conductive traces on one or more of the segment separators. This same technique must also be

employed to connect electrical elements of the Primary Power System lying outboard of the variable inductor arrays (145) with corresponding elements lying inboard thereof.

In any event, these crucial ballast capacitors are therefore properly thought of as belonging to both the Primary Power System and Field Induction System circuits. They provide the necessary electric force means by which a given primary voltage expansion ratio (as defined) may be supported and realized using the engineered instantaneous charge differential concept described. Because of the complexity of this aspect of the Generator's operation, the specific example below will illustrate the relevant principles using the respective temperature emissivity factors of the chosen field emitter and primary cathode materials with respect to the aforementioned 4ft. prototype model.

This temperature emissivity factor, e.sup.-.phi./kT, where `e` is the base of natural logarithms 2.71828 . . . , `k` is Boltzman's constant, and `T` is the absolute temperature in .sup.o K, derives from the famous Richardson-Dushman equation: a formula for the correct thermionic emission current density `J` of a clean metal cathode in vacuum having surface work function .phi.. And, expressed in mathematical terms, the principle of ratio equivalence defined above may be stated as follows:

Using field emitters of sintered 0.68/0.32 tungsten/copper composite and thorium-adsorbed tungsten primary cathodes, a 4 ft. diameter three-stage-rotor prototype unit of the invention's design would achieve a primary voltage expansion ratio equal to about 12,106 given a field emitter .phi.=4.408 eV and primary cathodes of .phi.=3.639 eV with both component sets at a temperature of 948.degree. K (or 675.degree. C.) as figured per the above equation. The field voltage expressing this ratio is verified in the Detailed Calculations hereinbelow.

It is important to note that this equation can readily be solved for the required primary cathode .phi. where the projected mean operating temperature of the primary cathodes is given (as it would be in operation), and where the field emitters' .phi. is also fixed and known but their actual operating temperature within a range of possible values must be experimentally or theoretically obtained.

The external breakdown discharge current once initiated and sustained in this manner is generally limited only by the engineered design characteristics of the unit pentode arrays which comprise the Field Induction System. In particular, the negative DC bias voltage applied to the unit pentode array control grids (65) must be sufficient to limit the total primary induction ring array current to a value within the safe operating ampacity of the rotor. For purposes of this text, the term "full-power" as used in relation to the Primary Power System and its incorporating device shall be taken to indicate a corresponding rotor speed wherein a full nominal field envelope voltage is achieved, maintained, or exceeded. Such an operational state is depicted in FIGS. 11, 12, and 13.

Field Current Bias

In a simple single-stage rotor embodiment of the Generator used as a "Thermal Power Unit", no active biasing of the current in either of the two current-carrying portions (140) of the field envelope (which are otherwise symmetrical) need take place at the primary arrays, and the current comprising each such driving portion of the field is essentially equal. In the preferred three-stage rotor embodiment intended for propulsive units, the field current is actively biased or proportionally shunted by the primary arrays between such field envelope portions (140) to render the impulse thrust developed thereby mutually non-isometric along the Generator's vertical centerline. Several important considerations directly related thereto are discussed below, and reference should generally be made to FIG. 7 in this section.

The Generator's maximum full-power total field current must be equal to the rated DC parallel ampacity of the rotor segments, as figured using traditional methods. An operational minimum full-power field current in any propulsive three-stage rotor device used as an "Impulse Drive Unit" should then be considered as equal to either one-half (1/2) of the so-rated rotor ampacity or a level of total rotor current sufficient to allow the Generator to produce a net vertical thrust equal to its own weight, whichever is the lesser.

Given the minimum engineered amplification factor of the unit pentode arrays (69) earlier stated, this minimum full-power field current may in all likelihood be maintained with an average value of primary array negative bias voltage (as applied to the stationary control grids (65) shown in FIG. 7) which is less than or equal to about one-half (1/2) of its specified design-maximum value. If no unidirectional or alternating voltage component of the Field Induction System current is present, this said average negative bias voltage value constitutes the primary arrays' "zero-signal" bias voltage and the primary arrays may be said to be in a zero-signal field bias condition (as mentioned earlier hereinabove).

Each of the two said driving portions (140) of the Generator's field envelope may be referred to as a "field hemitorus" because of its postulated shape, and the maximum individual field hemitorus current at any given value of operating rotor current should at all times be limited to a level which is less than or equal to two-thirds (2/3) of that operating rotor current. Peak net field thrust will then equal one-third the total isometric thrust. Assuming the said given amplification factor, this maximum advisable hemitorus level of proportional total field current may in all likelihood be maintained with an average value of negative bias voltage applied to the corresponding primary array's control grids (65) which is equal to approximately one-third (1/3) of its specified design-maximum value (or less proportionally at a rotor current level which is less than rated ampacity).

Due to the lag time in heating either of the two power resistor (63) networks through which an increasing field hemitorus current must return, the negative bias voltage applied to the corresponding primary array's control grids (65) may be briefly reduced to as little as one-sixth (1/6) of its specified design-maximum value (as a standard minimum operating control grid voltage) or less proportionally at a rotor current level which is less than rated ampacity.

The minimum individual field hemitorus current at any given value of operating rotor current should at all times be maintained at a level equal to or greater than one-third (1/3) of that operating rotor current. Assuming the said given amplification factor, this minimum advisable hemitorus level of proportional total field current may in all likelihood be maintained with an average value of negative bias voltage applied to the corresponding primary array's control grids (65) which is equal to approximately two-thirds (2/3) of its specified design-maximum value (or less proportionally at a rotor current level which is less than rated ampacity).

Due to the lag time in cooling either of the two power resistor (63) networks through which a decreasing field hemitorus current must return, the negative bias voltage applied to the corresponding primary array's control grids (65) may be briefly increased to as much as five-sixths (5/6) of its specified design-maximum value (as a standard maximum operating control grid voltage) or less proportionally at a rotor current level which is less than rated ampacity.

It is important to note that the current passed by the unit pentode arrays (69) will depend to a great degree on the accelerator grid (66) voltage rather than on the overall primary array potential difference, just as in any standard vacuum tube which employs a screen or accelerator grid whose positive voltage is less than the applied plate voltage. It therefore becomes evident that this positive grid (66) voltage may also be modulated in a manner similar to the negative

control grid (65) voltage. This type of `duplex` signal-handling or control voltage response capability allows the unit pentode arrays (of either primary induction ring array) to amplify a resonant frequency communications signal while simultaneously controlling an independent level of current-contingent thrust.

In any event, it can be seen here in light of the Law of Conservation of Momentum that a sizeable force of thrust will be developed by each field hemitorus (140) from the relativistic impulse of its constituent electrons incident upon the collector housing sections (5), and that suitable means have been provided for rendering such mutually-opposed y-axis thrust vectors variably non-isometric.

A less obvious but very important distinction which should be made in regard to the EDF Generator's production of such electrically-developed thrust is certainly this: it is not necessary that the Generator or in particular its positive hull sections (5) (or Field Hub) provide the work required to move the field current charge against the field potential gradient. Per classical electric field theory, the work may be done by the charge itself in being repelled along the potential gradient. In the first case, work is `performed` and in the second it is `recovered`. Furthermore, it can be shown mathematically in light of the preceding distinction that any net recoil force experienced by the negative hull Emitter Ring (47) is strictly Newtonian in nature, compared to the relativistic impulse thrust produced at the Field Hub, and that the peak value of such recoil would amount to no more than about 3/1,000 of one percent of the peak net value of the said thrust.

Therefore, the Electrodynamic Field Generator's input rotary torque drive means will provide the work-energy required to establish and maintain the rotor's rotation and the resultant field potential gradient that is induced in the manner described, and the electron charge comprising field hemitorus current will then do the work required to effect its passage toward the positive Field Hub. The resulting collisions are almost completely inelastic, so momentum and kinetic energy are conserved independently, and the field current's gained kinetic energy is recovered almost entirely as heat.

Field Voltage Control System

Accordingly, it can also be seen that the interactive factors or features which result in the EDF Generator's exhibited field voltage as a function of its rotor voltage are much more complicated in nature than the simple turns ratio which defines an AC transformer's secondary voltage in terms of its primary voltage. And because of the extremely high primary voltage expansion ratios which will be operative in large devices, small fluctuations in the Generator's stationary primary array electrode voltages can conceivably cause very large and undesirable fluctuations in the exhibited field voltage. Therefore, a relatively simple but effective Field Voltage Control System is provided which may be used to monitor, regulate, and adjust all individual primary cathode and grid voltages to optimum specified and/or interim operating values such that rotor ampacity is not exceeded, and this system anticipates the use of an associated onboard computer system (to render its various interactive functions automatic).

The embodiment of such a control system as shown in FIG. 10 is intended merely to provide a logical circuit model which is illustrative of the principles of the invention, and of certain principles of appropriate circuit resolution which should be applied within such a system in light of the following aspects of its teaching, and not to preclude the use of other possible embodiments of such control system circuitry.

The cathode elements (64) of each plane-parallel electrode system or unit pentode array (used to link the rotor assembly to the positive housing sections) are to have a surface work function .phi.

which is significantly lower and/or an operating temperature which is significantly higher than that of the rotor field emitters (17), and will therefore tend to exhibit a comparatively much-higher electron emissivity, such that the ratio of their respective temperature emissivity factors (which are each represented by e.sup.-.phi./kT) has a very determinate effect upon the respective exhibited ratio of the device's external discharge field voltage to the primary DC voltage generated internally.

Referring to FIG. 10, these primary array cathodes (64) must be composed of tungsten or another refractory metal which may also be either impregnated with thorium oxide or thorium metal submonolayer-adsorbed to achieve such lowered comparative surface work function, and, to calibrate their emissivity relative to that of the rotor field emitters (17) as a means of defining and determining the device's external field voltage relative to its primary array potential difference (or half the rotor voltage).

The Field Voltage Control System as shown is basically designed to directly accept the rather high positive induced voltage of the stationary anode rings (58) (shown in FIGS. 8 and 9) for the purpose of providing the primary accelerator grids (66) with their standard DC operating voltage. Due to the linear scalability of the Generator's overall design, the nominal (or zero-signal) value of such voltage relative to chassis ground (10) is expected to be approximately +362 to +483 volts per foot of hull diameter in three-stage and single-stage Generator embodiments (respectively). An isolation diode (126) and switch or relay (124) prevent such positive voltage from being neutralized by negative current(s) elsewhere in the control circuit.

Any one or more of the stationary electrode elements (64)-(67) comprising each said unit pentode array may be artificially cooled, as a means of further regulating the device's external field voltage, and/or subjected to modest variable DC control voltages at times to further assist in the interim adjustment of that unit pentode array's current.

A very high value capacitor (116) or a plurality of separate high value capacitors connected into a parallel or series-parallel matrix thereof may be employed to store the displacement charge caused within the Primary Power System by the charging of the rotor-mounted ballast capacitors, as part of such Field Voltage Control System. Said displacement charge holding capacitor(s) (116) may hereinafter be referred to as "ballast compensating capacitor(s)".

A very high value capacitor (117) or similar such capacitor matrix may also be employed to prevent the grounding of positive housing section potential by ambient ionization charge, from operation in air during the device's start-up period before such sections are fully enclosed (by the external field hemitorus currents), as a further part of this Field Voltage Control System. Such bulk electron storage capacitor(s) (117) may hereinafter be referred to as "ambient charge capacitor(s)".

The negative plates of these ambient charge capacitors are to be isolated from ground during rotor spin-up, in order to effect a net negative charge storage, and so their positive plate charge is supplied by a dedicated common variable DC voltage supply (98) which is oppositely connected to the ground frame. Each ambient charge capacitor (117) employed during the device's start-up period may be selectively switch- or relay-connected by its negative terminal to an accelerator grid element (66) of one or more of said plane-parallel electrode systems, in order to effect and control the storage of such ionization charge. Each such start-up capacitor (117) may also be selectively switch- or relay-connected by its negative terminal via a variable resistor and/or diode to a suppressor grid element (67) of one or more of said plane-parallel electrode systems, in order to effect and control the distribution of onboard stored negative charge reserves from the

suppressor grid(s) (67) to the rotor, as a standard means of regulating the external field voltage (especially in the vacuum of space).

Said ambient charge capacitor(s) (117) may also be similarly connected by the negative terminal(s) thereof either to a separate source of true earth ground or to one or more superconductive current storage ring/s (200) (including charge deposition and retrieval means), for purposes of removing any excess ambient electron charge above the bulk storage capability of such capacitor or capacitor matrix which may be produced from normal or full-power operation in air--or other gaseous dielectric media.

Such superconductive current storage ring(s) would be used exclusively in large three-stage rotor propulsive models of the Generator, and thus constitute/s the means by which further expendable onboard charge reserves may be accumulated. The working core of each superconductive storage ring would preferably be a large but relatively thin torus (of small cross section) composed of solid mercury metal immersed in liquid helium, and as such would have a known ampacity measured in the hundreds of thousands of amps.

A linearly-actuated control rod (103) or similar mechanism may be used to effect a mechanically variable thermal junction between each primary array cathode or grid element (64)-(67) and a cold thermal mass of the same or similar refractory metal, maintained at the reservoir temperature of a secondary cryogenic housing coolant such as liquid air or nitrogen. The plate elements and dielectric media of each capacitor or capacitor matrix employed in the Field Voltage Control System could also be incorporated (in a suitable manner) into the coolant vessel which contains said cold thermal mass. This System's diodes would generally not be rated for mounting at such a low temperature.

The voltage control circuit shown in FIG. 10 is modular in nature, in that one such unit is provided for each of the 72 unit pentode arrays associated with the Field Induction System (in the preferred embodiment). All measurements of primary electrode voltage(s), and of positive housing section voltage, are to be made with respect to the Generator's ground frame (10) (as generally depicted in FIG. 1): the metallic structural shell of the device's central chamber to which the rotor carrier assembly drive motor(s) should be mounted. This grounding method is referred to throughout as "chassis ground".

One thermal control rod (103) is provided for each primary cathode and grid element (64)-(67) which variably engages both a control rod socket (104) attached thereto and a thermal junction (101), which is attached to a cold thermal mass (102) maintained at the reservoir temperature of the secondary (cryogenic) housing coolant, by means of a linear actuator (not shown). Such control rod (103) may then be used to regulate that electrode's temperature to approximately the same temperature as the associated power resistor (at 675.degree. C. .+-.55.degree.). In this manner, small adjustments in cathode (64) emissivity may be made as necessary during operation and the various grids may be closely matched in temperature to that of their respective cathode(s) to ensure the accuracy of mutual primary electrode voltage balance. Any deviation of cathode (64) voltage from a chassis ground potential may be detected and measured across a very-high-value resistor (107), connected between said cathode(s) and chassis ground, which is preferably of a large carbon type having multiple fixed taps (and across which an output voltage may exist).

A dedicated common variable DC voltage supply (95) is provided for all primary cathodes (64) as a means of ensuring an optimum cathode potential with respect to ground, despite fluctuating power resistor temperatures (in three-stage rotor devices where field hemitorus current is variably biased). This supply is shunted with a double-pole/double-throw switch or relay (123) to

enable either a positive or negative interim control voltage to be applied to the cathodes (64), in order to hold their true potential as close to ground as possible. A similar voltage supply (97) and switch/relay (123) is also provided for all primary accelerator grids (66) as a means of modulating the fixed level of applied positive grid voltage (from stationary anode ring (58)) and therefore the level of field hemitorus current, independent of the level of applied control grid (65) bias. In both cases, these DC supplies are isolated from chassis ground by blocking capacitors (106) to inhibit any net charge loss or accumulation from accruing to the ground frame (10) during operation (in propulsive units which are not connected to true earth ground).

A dedicated common variable DC voltage supply (96) is provided for all primary control grids (65) as well. This voltage supply is not capacitor-isolated from chassis ground in this case, so that the primary control grids (65) and cathodes (64) may have a common direct ground reference as they would in a typical vacuum tube circuit arrangement. The said control grid supply (96) should also have a resistor (107) of the same type as that provided for the associated cathodes (64), connected between such supply's positive terminal and chassis ground. These two criteria further ensure the accuracy of mutual primary electrode voltage balance, and the nominal (or zero-signal) value of such DC control grid voltage relative to chassis ground is expected to be approximately -36 to -48 volts per foot of hull diameter in three-stage and single-stage Generator embodiments (respectively). A variable bypass resistor (108) may be adjusted to ensure a very low and relatively constant DC operating grid current despite fluctuations in the value of the AC input signal resistor (110), as discussed below.

Ballast compensating capacitors (116) are provided whereby negative outrush charge from the stationary anode rings (58) and the positive plates of the rotor ballast capacitors may be purged from the Primary Power System during rotor spin-up, to prevent stage electrode array voltage ratings from otherwise being greatly exceeded, via these same two anode rings (one per primary induction ring array), connecting switch/s or relay/s (124), and resistor/s (125). During the Generator's spin-up and `run` periods, each ballast discharge switch/relay (122) is normally open; switch/relays (124) are `run-open`. Upon rotor de-spin, such ground-restoring charge must be proportionately returned to each stationary anode ring via switch/relays (124) and resistors (125), and to the Primary Power System as a whole via the discharge switch/relays (122) and suppressor grid discharge shunts (with variable resistors (113) and diodes (115)), for the most part after vacuum chamber current to the hull Emitter Ring has essentially ceased.

Then, such normalizing charge may be `dumped` across the described suppressor grid discharge shunts at a rate sufficient to ensure that the entire Primary Power System returns to a ground potential (by brief direct surge rotor-shorting to the outer induction array anode rings). Thus, resistors (113) provide a variable time constant for the discharging of the said compensating capacitors (116). An a independent common variable DC voltage supply (99) whose negative terminal is connected to the ground frame (10) ensures that the proper total ballast compensating charge described may be stored against the high positive applied potential of the stationary anode rings (58).

The ambient charge capacitors (117) absorb ionization charge (arising from operation in air) which perforce must fall into the potential well(s) established by the positive housing sections at least until the field envelope's two hemitorus currents are fully formed, and which would otherwise tend to ground the desired positive housing section voltage. Therefore, the negative plate voltage of these storage capacitors (117) is applied from another dedicated DC supply (100), which is similar to that (99) provided for the compensating capacitors (116), by means of a common dpdt switch/relay (119). None of these DC supplies (95)-(100) are to have internal load-line diodes.

The variable output of this "dynamic compensating" voltage supply (100) is to be approximately the same as that of the ambient charge capacitors' positive voltage supply (98), thereby allowing the said capacitors (117) to be gradually saturated during rotor spin-up with electrons collected at the accelerator grids via storage shunt inrush current switch/relays (121) and diodes (114). During the Generator's spin-up and run periods, the "control gate" switch/relays (119) are normally closed such that the negative pole of supply (100) is connected to the negative plates of these same capacitors. In the Generator's run and de-spin periods, however, switch/relays (121) are normally open.

Any excess ionization charge above these capacitors' joint storage capability which might lower the `run` Field Induction System circuit voltage must then be either grounded off or deposited in said superconductive storage ring(s) (200) (in ungrounded propulsive Generators designed for maximum ambient charge storage), via the same said throw of control gate switch/relay (119) in conjunction with shunt switch/relay (120) and resistor (112). In this case, the storage shunt switch/relays (121) remain run-closed. Otherwise, the slow `run` release and distribution of negative charge reserves to the rotor from the storage capacitors (117) is effected by the gradual synchronized relaxation of the voltage/s from supplies (98) and (100) across switch/relay (119) and discharge resistor (113), with shunt switchs (120) and (121) open, while diodes (114) and (115) ensure that the said capacitors (117) may only be discharged in the manner described.

This discharge of stored charge reserves actually takes place from the suppressor grids (67), which may serve as low-power electron emitters given their proximity to the primary anode rings (68). An isolation diode (127) prevents such negative charge from neutralizing accelerator grid circuit voltage. It should be noted that the suppressor grids may be held at ground potential as they would in a typical beam power pentode circuit arrangement, or at a very low if not negligible negative voltage for purposes of effecting such controlled low-power charge release, by means of [i] a minor negative voltage induced thereon by the corresponding proximal primary anode ring/s (proportional to their capacitance relative thereto); [ii] the combined DC voltage drop across the paralleled resistors (109) and (111) connected to their respective accelerator grids; and/or [iii] the voltage of the dynamic compensating supply (100) relative either to earth ground and resistor (112) or to chassis ground and the relative opposing voltage of the ambient charge storage capacitor's supply (98).

The bypass resistor (109) provided between each accelerator grid (66) and its associated suppressor grid (67) returns the inevitable stationary anode ring (58) and accelerator grid (66) DC circuit current to the rotor from the suppressor grids (67), and simply assists in maintaining each suppressor grid at a DC potential as close to true ground as possible. The suppressor grid resistor (111) which is paralleled with said bypass resistor (109), however, is analogous to a plate resistor on behalf of the corresponding inner (rotor) induction array in both the single- and three-stage rotor embodiments, in that any rotor circuit final-stage AC output voltage variations will be reproduced across it once field envelope circuit current commences. Likewise, any AC signal oscillations from an outside (remote) source which are induced upon the field envelope current will immediately act as a detected first-stage AC input for rotor circuit amplification, and again will be reproduced across the said grid resistor (111).

Therefore, any rotor or field circuit AC potential difference across this grid resistor (111) provides an output signal voltage that may be: [i] received by an actual communications console or a simple AC control-voltage operating circuit in the Generator's central cabin; and/or [ii] reapplied either in- or out-of-phase with the voltage across the input signal resistor (110) of the associated control grid (65) as a further AC signal voltage amplification or suppression stage (respectively). An input AC signal or control voltage may also be applied across the control grid

resistor (110) from such an onboard communications console or control-voltage operating circuit, as would generally apply to three-stage and single-stage devices, respectively. This grid resistor is variable for circuit tuning purposes related to resonant frequency communications (if desired).

It can be seen from FIGS. 8 and 9, however, that the AC output amplification stage (or inner induction array) of the Primary Power System and its input stage (or outer induction array) are directly coupled by the rotor segments (14) in both single-stage and multi-stage rotor embodiments. Thus, the rotor electrical circuit as configured will be subject to continuous positive (or regenerative) feedback of any AC signal voltage present either in the field current or on the rotor, as described above. To provide a desired or requisite level of signal amplitude suppression or compensation, negative (or inverse) feedback may be applied to the rotor circuit using the feedback coupling relays (129) and stage transformers (130) shown in FIG. 10.

Because plate voltage and grid voltage are typically 180.degree. out of phase in a beam pentode arrangement such as the Generator's primary arrays, inverse feedback is achieved when the voltage fed back to the control grid (65) has the same waveform and phase as the plate or anode (68) voltage. In related traditional practice, an inverse feedback signal applied to the input (control grid) current decreases AC amplifier input impedance and distortion; an inverse feedback signal proportional to the output (plate/anode) current raises the output impedance of such amplifier. Therefore, an inverse feedback AC signal proportional to the current through resistor (111) which is applied in-phase with the AC line current across resistor (110) decreases the rotor input stage impedance yet also reduces the amplitude of the AC output current. A loss of total amplification (through a fractional stage `gain`) results, but is accompanied by a decrease in signal distortion.

The stage feedback transformers (130) ensure voltage reference isolation between such stationary amplification or suppression stage and the corresponding rotor stages, when AC signal feedback across the control grid resistors (110) is necessary or desired. A double-pole/double-throw switch/relay (129) may be used to decouple each such transformer from the input signal resistor (110) side of its circuit connections, and/or to apply either positive (regenerative) or negative (inverse) feedback to the rotor AC amplification stage(s), and tunable blocking capacitors (131) isolate the transformers from circuit DC voltages. The coupling transformers (130), isolation relays (129), and blocking capacitors (131) are therefore only necessary in Generator embodiments not having a central AC control-voltage operating circuit with suitable inverse feedback characteristics and in three-stage Generator embodiments which may be used in a communications capacity. In the latter case, an optional capacitor across the secondary or control grid resistor (110) side of each such transformer (in parallel with the said resistor) may once again be employed in parallel resonance fashion, and is indicated in FIG. 10.

During continuous operation of an EDF Generator in the vacuum of space, the exhibited DC field voltage will tend to rise gradually as the total amount of charge contained in the field envelope circuit is gradually reduced through unavoidable electron leakage losses (primarily at the hull Emitter Ring peripheral edge). To compensate for this effect, a small amount of stored ambient charge must therefore be continually released at the suppressor grids (67) into the rotor return current. The rate at which this gradual discharge must be effected is dependent upon the observed field leakage rate, as only a rough approximation of this leakage may be pre-calculated. It is for this reason that at least one superconductive storage ring (200)--containing a tremendous quantity of reserve ambient charge in the form of a continuous zero-loss current--must be included in any ungrounded Impulse Drive unit used in space exploration, as the capacity of such storage ring determines the vessel's effective range of operation.

It is postulated that the external field current's energy density will be sufficiently enormous that it exhibits a virtual self-evacuating operational condition above a certain ultra-high field voltage in propulsive three-stage EDF Generators, and such a condition is essential to the successful atmospheric ground launch thereof Such kinetic occlusion of a significant portion of the otherwise available ambient ionization charge may also occur once the field envelope is fully formed even in ground-based single-stage devices operated at breakdown field intensity. During continuous operation of such ground-based devices in a gaseous atmosphere, field leakage losses which could cause an undesired gradual field voltage rise if they exceed available ambient charge accretion may be compensated by bypass-shunted charge from earth ground. In this case, the positive pole of supply (100) is connected at low power via dpdt switch/relays (119) to earth ground, in order to avoid a limited spin-up/run/de-spin repeating duty cycle.

General Method of Construction

The actual construction of an Electrodynamic Field Generator of any given size is relatively straightforward, whether of a manned propulsive embodiment or not, and proceeds in fact from the inside out. Referring generally to FIG. 1, one of the most practical features of the construction process is that virtually the entire instrumentation and payload compartment or "Central Chamber" (2) may be outfitted first, before any portion of the Primary Power System is assembled or even necessarily designed. In the preferred three-stage embodiment to be used as an aerospace Impulse Drive Unit, the central chamber should obviously incorporate low-density materials wherever possible.

Construction next proceeds with the Generator's ground frame (10): the metallic structural shell which provides an enclosing framework for the central chamber to which all ancillary inboard electrical equipment may be grounded. This structural framework should be as strong, lightweight, and nonmagnetic as possible, and may preferably be of a welded tubular design using stainless steel or a suitable titanium alloy.

Once the ground frame and enclosed central chamber are completed, including the installation of a preferred total of 32 high-torque DC motor-generator rotor drive units (in four sets of eight), the two rotor mounting frame sections and attached ring gear/s (8) of the "Carrier Assembly" may be built and dynamically balanced (using a temporary peripheral spacing "jig"). Then, construction of the composite "Rotor Assembly" may commence with the laying out of equal numbers of copper segments (14), ceramic segment separators (16), and refractory composite field emitters (17) which are all of exactly equal weight by type, the latter components providing the nonconductive base to which other rotating electrical hardware may be attached.

When the three sets of said principal large rotor pieces (which preferably number 180 each) are bound together with electrode rings silver-soldered to the segments, and clamped between the two halves of the centrifuge-style carrier assembly, the assembly of the "Primary Power System" itself may begin. Once thin insulative rotor surface "facing", the aforementioned recessed and conductive separator traces, and the rotor ballraces (25) have all been affixed to the base rotor assembly, and the field coils, electrode arrays, and other rotating components have been added, the fabrication of the vessel's "Structural Intercooler System" may proceed. When this secondary thermal conduit (hull coolant) system is completed and has been pressure-tested, the "Primary and Magnetic Arrays" may be installed--including the 5-armature variable inductor array sections depicted in FIG. 14. The primary (induction ring) arrays here are comprised of the unit pentode arrays (69) as individual assemblies each having an adjunct assembly comprising a field power resistor (63), dielectric buffer (45), and primary thermal conduit (48).

Finally, once the rotor has satisfied nonenergized operational mechanical clearance and dynamic balancing criteria (using a temporary outer rotor bearing support "jig") and a final complete thermal conduit system pressure test has been made, the "Outer Hull Components" may be installed. Thus, the basic vessel construction may be completed in a total of seven distinct steps or stages. Due to the tremendous weight of the finished rotor (as the device's most massive single assembly), an operating characteristic of utmost importance is the actual rotor speed required to maintain a specification field voltage which is figured using the method outlined in the Detailed Calculations below. This will determine the rotor's operating angular momentum, which in propulsive units must be sufficiently large to provide gyroscopic stability against the use of variably-imbalanced isometric thrust (produced by field hemitorus current) but not so large that the vessel's navigational and maneuvering characteristics are thereby rendered sluggish.

It can be shown mathematically that the nominal rotor speed for a 4 ft. diameter theoretical design prototype would be roughly equal to or somewhat less than that of a typical small electric motor. However, as the size of the device increases, it will be necessary to reduce rotor rpm due to the extreme increase in the rotor's `tip` speed and therefore the centrifugal forces to which it is subjected. Sufficient information is contained in the basic specifications which underlie this disclosure to allow engineers to reduce rotor speed as necessary in larger devices following the course of an intensive program of small device tesing; e.g., the projected nominal rotor rpm for a 20 ft. Thermal Unit is 1045.

Structural Intercooler System

The secondary thermal conduit sections which carry hull coolant or heat transfer fluid through the Generator's tapered "Drive Ring" (or the combined volume of the negative and neutral housing sections) must pass between the power resistor and unit pentode array assemblies, and so they must conform in outside dimension to the available space within the supporting framework of the neutral hull construction. The most unusual feature of these secondary conduits is that they also comprise (of necessity) the principle Drive Ring load-bearing members, and together they form the EDF Generator's structural intercooler system as illustrated in FIG. 14.

These secondary hull coolant conduits should be fashioned in a manner similar to the primary thermal conduits described hereinabove, and in the preferred embodiment would be formed in four types or varieties: [i] the initial outbound coolant supply runs (75), called "headers"; [ii] the circumferential heat transfer sections (76) (to which the Emitter Ring hull plates are fastened), called "peripheral shunts"; [iii] the inner (77) and outer (78) intermediary coolant runs, or "transfer links"; and [iv] the radial coolant returns (79) or "recovery lines". Within the Drive Ring, each of these conduit types may be fashioned as single sections which connect one to another in `series-parallel` branch systems or zones. To wit, one header (75) from a reservoir coolant manifold (74) connects to one peripheral shunt (76) which in turn connects to one recovery line (79).

Thus, a single coolant zone is illustrated in FIG. 14, the arrows indicating the direction of coolant flow. A molded ceramic support bracket (71) having integral elbows and a set of mounting "knuckles" may be used to secure the inner corners of each two adjacent negative hull plates (72), by means of a matching mounting ring welded to each inner plate corner and a retaining pin (not shown). Each Emitter Ring hull plate (72) is to have an angle-stock thermal transfer channel welded along but just inside its inner edge (as indicated by dashed lines), which encloses the corresponding peripheral shunt (76).

These coolant headers, shunts, transfer links, and recovery lines are preferably formed of molybdenum tubing, and would take advantage of the high thermal conductivity and electrical

resistance of a thin Alumina coating thereon to absorb excess heat from the single-stage Drive Ring hull and (in particular) the Emitter Ring hull plates. In single-stage rotor devices which are used as Thermal Power Units, the recovery lines then exit the Generator housing through two exchange manifolds (as stated earlier), from a preferred total of 72 individual coolant zones, to an external heat exchanger. Just how effective this method of cooling the Drive Ring as a whole will prove to be during operation in air, using the preferred liquid air or nitrogen coolant, is somewhat difficult to project. Liquid helium could alternatively be used in this respect to ensure adequate hull cooling, but would entail significantly increased piping and pumping difficulties in doing so.

It is expected, however, that the intercooler system described will be satisfactorily effective during the operation of three-stage devices in the vacuum of space, and is principally designed with this mode of usage in mind. Accordingly, it is believed that an Impulse Drive Unit operated in space will be able to purge its excess heat by actually circulating the primary conduit liquid sodium or equivalent through the secondary thermal conduit system (instead of the cryogenic coolant). In this case, the intercooler structure is used to transfer heat to the Emitter Ring hull plates as a radiative heat sink. This cooling method would provide the necessary means of liberating the Generator from permanent ground-based support to achieve free-ranging operation in space.

Neutral Housing Section Construction

In order to establish and withstand the action of the field envelope discharge current, the surface of the neutral sections of the Generator's housing or hull (or "Neutral Ring") must be constructed entirely of specialized nonconductive material(s) which should be applied in two layers to an underlying superstructure that is actually conductive in nature. It is proposed that overlapping ceramic `tiles` be used in this regard, in a manner rather like that employed on the NASA space shuttles, which are adhesed to an underlying deck of structural nonmetallic sheet stock While the intercooler system conduits (described in the preceding section) comprise the principal load-bearing members which support the Drive Ring portion of the hull, a system of beams (153) and struts (152) that are also composed of the same nonmetallic structural material as the deck or a similar and compatible material should be utilized to further strengthen and `unitize` the Drive Ring superstructure such that an internal hard vacuum may be drawn and maintained prior to operation. These secondary load-bearing members are also depicted in FIG. 14, and in a preferred embodiment these members and the base deck material itself would be composed of a carbon composite commonly referred to incorrectly as graphite.

Sophisticated carbon composites similar to those found in golf-club shafts and racing-bicycle frames were first developed to make use of their special combination of extreme strength, rigidity, and lightness in aerospace applications. These materials are generally made from polyacrylonitrile (PAN) carbon fibers which are heated under tension to drive off the non-carbon portion. The individual fibers are about 7 microns in diameter and approach 300 kpsi in tensile strength. They may then be pulled into a rope-like `tow` or woven into a fabric-like `matte` before being coated with either epoxy or polyester resin. Therefore, carbon composites are eminently suited to forming rods, tubes, and sheets, and display excellent vibration damping characteristics. The final product is, however, still very expensive per pound.

To simplify the vast diversity in specialized grades of PAN carbon composite for purposes of this application, this material should be considered as coming in two basic density grades: low-density "deck" grade (at about 35% of the specific gravity of sheet steel), and high-density "beam" grade (at about 65% of the specific gravity of structural steel). It is also available in two

standard temperature grades, depending on the bonding agent used: a 350.degree. F. rating (lo-temp) epoxy-bonded material and a 750.degree. F. rating (hi-temp) polyamide-bonded composition. The hi-temp grade only should be employed in the Neutral Ring, but the lo-temp grade may be used to build the Central Chamber.

Thus, a low-density/hi-temp grade of carbon composite laminate should be used as the basic deck material in construction of the Neutral Ring hull sections. To wit, this deck layer itself is initially affixed to the vessel superstructure by solvent welding and/or mechanical means. The PAN carbon deck, a middle layer of ceramic substrate plates and an outer skin of exolayer tiles together then comprise the composite Neutral Ring hull. Several factors enter into the selection of an appropriate ceramic material for the substrate layer plates. Of primary concern here is that the material of choice have a very high volume resistivity and very low thermal conductivity at temperatures from 300-500.degree. C. It is also important that the material have a very low thermal expansion coefficient, as the substrate layer plates must be bonded to the deck layer with a refractory-class adhesive. Therefore, the substrate material should also be non-vitreous and have relatively high porosity to promote adequate adhesion. One of the Cordierite class of compounds, bearing CeramTec designation 447, has relatively low hardness and flexural strength but should function admirably in Thermal Power Units as the center layer of a bonded composite construction given its other highly desirable characteristics. Impulse Drive Units will require an alternate substrate plate material as discussed below.

The selection of a ceramic material for use as the exolayer dielectric thermal tiles of the EDF Generator's housing or hull is contingent upon the operative field voltage, and therefore different materials must be specified for Thermal and Impulse Drive Units. To prevent substantial skin conduction losses, the minimum dielectric value k for the exolayer tile material used in Thermal Power Units has been calculated (using the peak field voltage) at approximately k=9. Therefore, the material of choice is a Zirconia composition bearing CeramTec designation 848, with a minimum (high-frequency) dielectric constant of 28. Even though this material has a comparatively high thermal expansion coefficient, it has very low thermal conductivity and is very dense and hard. Moreover, it exhibits exceptional flexural strength and resistance to fracture.

The minimum dielectric value k for the exolayer tile material used in Impulse Drive Units has been calculated at approximately k=107. Therefore, the material of choice is the same titanate composition prescribed for the dielectric buffers (and described in some detail in a previous section). Known chemically as Sodium Bismuth Titanate (and commercially as Kezite), this highly unusual compound is technically a piezoelectric material, but is also ferroelectric in that its dielectric constant actually increases on temperature rise to a peak low frequency value of about 3,100 at its 655.degree. C. curie point. Like most ferroelectrics, its tensile and flexural strengths are quite low yet it is very dense and exceedingly hard. It does, however, exhibit a thermal expansion coefficient which is very high for a ceramic material.

The expected higher flexural stresses upon the Neutral Ring of an Impulse Drive Unit (compared to a Thermal Power Unit) may prove sufficient to crack the substrate plates were they composed of the Cordierite material described above. The Zirconia compound mentioned earlier should therefore be substituted for Cordierite 447 as the substrate plate material in Impulse Drive Units. This would likely stiffen the composite Neutral Ring hull adequately to prevent such stress cracking, while effecting a much closer match in thermal expansion coefficient to the titanate tiles. In both Thermal and Drive Units, the exolayer tiles should be applied to the substrate plates with a refractory-class adhesive in a mosaic overlay pattern, such that the edges of each exolayer tile are evenly spaced as far as possible from the underlying edges of the nearest substrate plates.

Because the underlying deck layer of the Neutral Ring hull will be quite conductive when composed of carbon composite sheeting, and referring now to FIG. 1, it becomes imperative to use an auxiliary dielectric buffer (50) between the inner edges of the Emitter Ring (47) hull plates and the outer edge of the said deck layer to prevent an otherwise enormous deck leakage current from occuring. Although it might seem that the much-cheaper and nearly-as-strong fiberglass composites available (which are nonconductive) would tend to minimize any such leakage current condition, their use would not prevent the possible build-up of unacceptable levels of static charge within the working induction compartment (12). Therefore, the use of conductive deck material ensures that the Faraday shielding principle protects Neutral Ring components from transient static voltages because the presence of a finite deck leakage current means the deck layer is a charged conductor, whereupon any net static charge must be external.

A secondary concern is the actual operating temperature of the contact areas where the deck layer abuts to both the auxiliary (50) and primary (45) dielectric buffers, which must be kept below the 750.degree. F. temperature rating of the carbon composite. It can be shown mathematically that the deck leakage current can be held to a thoroughly acceptable fractional amperage per cm.sup.2 of such contact area if this condition is met. In Thermal Power Units, the use of a secondary cryogenic hull coolant should keep the auxiliary buffers (50) and outer deck contact areas at a temperature which is under the said rating. Doing so at the primary buffer (45) contact area locations may well require the use of auxiliary cryogenic thermal conduits in both Thermal and Drive Unit models of the EDF Generator. The auxiliary dielectric buffers in any given Generator should be composed of the same material used in that device's exolayer tiles, and should be of about half the radial thickness of the primary buffers employed therein.

While the specific materials discussed above should not be construed as critical to the EDF Generator's proper construction, their properties and characteristics are highly indicative of the rather involved considerations which must be undertaken to ensure that the neutral sections of the vessel hull are physically suited to optimizing a given size device's performance and minimizing its housing maintainance or repair requirements.

Stationary Electromagnetic Armatures

Because the EDF Generator's stationary electromagnetic armatures have no bearing on the device's rotor or field voltages, and no direct connection therewith, they are properly thought of as being part of neither the Primary Power System or Field Induction System circuits but rather a separate ancillary subsystem intended to optimize the invention's overall performance and efficiency in a number of important ways. To this end, their main purpose is to create and independently control a variable level of both rotor torque and field current rotational force, as necessary or desired.

As depicted in FIG. 14, the individual stationary armatures (37) (or "variable inductors") may be installed in 5-armature groups or array sections within the Neutral Ring of the hull, using notched and mating supports (151) which firmly clamp the armatures about a reduced diameter center section of each armature core. These armatures and a basic control circuit arrangement for them are shown in FIG. 16, with the polarities indicated being those which would result in a clockwise rotation of the rotor as viewed from above. This armature power distribution system may be manually adjusted and/or automatically controlled (using a computer and/or other circuitry).

In both single-stage and three-stage embodiments of the Generator, each of the two electromagnetic armature arrays should be wired in parallel from one or more separate source(s) (185) of low-voltage DC current which is/are chassis-grounded and which is/are common to the

armatures (37) of that array. No variable regulation or biasing of individual armature DC current(s) in single-stage rotor or Thermal Power Unit devices is necessary. The desired individual biasing of armature DC current in three-stage rotor devices, for propulsion-related reasons explained below, may be simply accomplished through a variable resistor (184) associated with each armature and its DC power supply subcircuit(s). A minor unidirectional or alternating voltage component of such armature supply current may be added across or in parallel with such resistor (184), using an AC power source (186) and/or suitable control interface of a conventional nature, in either single-stage or three-stage Generator embodiments as desired.

Each stationary armature (37) incorporates two separate electrical coils (180)-(181), to be operated principally on DC voltage, which are formed of conductive insulated magnet wire multi-layer wound upon a single ferromagnetic core. Each such armature core also incorporates a connecting center section or "flux reductor" (182) between said separate coils which is of a significantly reduced cross-sectional area with respect to the balance thereof, and which is designed to saturate magnetically when the respective core flux density of either of said coils is approximately equal to or greater than half saturation value. Pure annealed iron or low-carbon steel should be used as the armature core material, due to the high permeability, superior intrinsic induction, and low hysteresis thereof.

The inner or "flux initiator" coils (181) of these electromagnetic armatures (or those closest to the rotor) may be used as a means of creating axial magnetic fields of force (144) which are perpendicular to the plane of the current-carrying rotor segments (14). Thus, when powered collectively at a common DC current value, the said inner armature coils (181) in conjunction with their respective cores may serve as a source of uniform yet variable secondary input rotary torque (or in a torque-assist capacity) for the invention in the course of its normal operation as an electrical generator.

The flux initiator coils (181) are so-named because their as-wound polarity relative to the fixed outward direction of the primary DC rotor current establishes both the direction of rotor rotation and the required winding direction and polarity of the outer (and similar) armature coils (180). The said inner coils (181) are energized by a variable DC power supply (185), through an output variable resistor (184) and a filter diode (189) which blocks induced positive AC half-cycles (if any) from crossing the negatively-grounded DC supply (185). Such power supply (185) must, however, be sufficiently rated to carry any corresponding induced unidirectional negative current impulses to ground, and may be of a solid-state or rotary induction design.

The axial armature-produced fields (144) described may also be individually and variably superimposed on the rotor to develop a selectively controllable force of rotational torque upon its current-carrying segments (14), through variable regulation of the principal DC current in individual armature inner coils (181), such that a locally-unbalanced force of angular acceleration may be applied to the rotor and therefore a directional force of horizontal thrust may indirectly be imparted to the housing for lateral flight maneuvering in propulsive three-stage rotor devices.

The outer coils (180) of the stationary electromagnetic armatures, or those closest to the field envelope, may be used as a means of creating axial magnetic fields of force (144) which in this case are essentially perpendicular to the described field current arc trajectories. This situation is best illustrated in FIG. 12, which shows the hull location of the two variable inductor arrays (145) (or circular groups of armatures (37)). Thus, when powered collectively at a common DC current value (including any minor unidirectional or alternating component thereof), these outer

armature coils (180) in conjunction with their respective ferromagnetic cores serve to impart an attenuating yet holistic and orderly rotational vector moment upon the external discharge current. The general effect of such applied magnetic rotational force, which may be used to modify or modulate the field's electrodynamic characteristics, is further depicted in FIG. 13.

Referring again to FIG. 16, and to continue in the same vein, it is postulated that the quasi-coherent aspects of the field envelope may actually be optimized through the proper control of the amplitude, frequency, and/or phase relationships between any minor AC voltage component of the field envelope current and the said minor AC current (if any) collectively supplied by AC power source (186) to the outer or "transflection" coils (180) (of each variable inductor array). This consideration applies to both single- and three-stage embodiments of the Generator, although it is decidedly more important in the case of the latter, and may also allow the engineered reduction of field radiative emissions.

These transflection coils (180) are so-named because they may be used to impart a variable transverse deflectionary force upon all of the radially-impinging field current electrons. In the region(s) of the field envelope shown in FIG. 11 between the surface of each neutral hull section (4) and the corresponding field envelope inner boundary (142), this magnetic force may in fact be large enough to produce a continuous annular flow of "displacement charge" current. In any event, and as shown in FIG. 16, such outer armature coils (180) are also energized by a variable DC power supply (185) which is similar in type to that of the inner coils (181), through an output variable resistor (184) and filter diode (189). In addition, a variable AC power source (186) may impress a minor unidirectional or AC voltage upon the DC current supplied to the said transflection coils (180), either across or in parallel with the output resistor(s) (184) of their respective DC power supply subcircuit(s), through separate output variable resistors (184) and DC blocking capacitors (188) connected to said AC power source.

The axial magnetic fields (144) produced by the armatures (37) may also be individually and variably superimposed on the field envelope to develop a selectively controllable rotational force upon the described field hemitorus current, through variable regulation of the principal DC current in individual outer (or transflection) coils (180), such that a locally-unbalanced force of angular acceleration may be applied to such hemitorus current. Any such angular force imbalance will cause a corresponding change in the local field current density and therefore a secondary directional force of variable thrust in the z-axis may indirectly be imparted to the housing in propulsive devices, yielding a further measure of navigational attitude control over non-isometric thrust produced by the Generator which may otherwise be largely unilinear.

Given the nature of the flux reductor (182) as described above, it can be seen that either the inner or the outer armature core sections may be collectively or individually operated at any flux density above half of saturation level without significantly affecting the operating flux density of the respective opposite core sections, provided both corresponding sets of armature coils ((181) and (180) respectively) are powered by DC current of the same relative polarity. Thus, the base collective full-power operational level of flux density in the inner armature core sections of a three-stage rotor Impulse Drive Generator should be roughly half saturation level, in order to facilitate the achievement of temporary local rotor torque imbalances for propulsive purposes as described above. Such inner core section base flux density for single-stage rotor or Thermal Power Unit devices may be any desired in a range between 0 and 100% of saturation.

As shown in FIG. 16, means have nevertheless been provided for reversing the fundamental DC polarity of either the inner (181) or outer (180) coil of any given armature (37), without changing the given polarity of such coil's DC power supply (185), using a dpdt relay (190). It can be seen

that this simple feature allows a counter-polarity magnetomotive force (or counter-mmf) to be applied to either wound core section of any given armature, with respect to the core polarity of that armature's opposite wound section. This feature, when taken in conjunction with the described nature of the flux reductor(s), enables the outer armature core sections in both single- and three-stage devices to be operated at nearly any flux density within their output capability which might be required to optimize the desired quasi-coherent properties of the field envelope, despite the relative polarity and/or flux density of the inner armature core sections. In both single- and three-stage devices, these same two features also allow a substantial level of braking or counter-rotational torque to be applied to the Generator's rotor --by any or all of the inner armature core sections--while maintaining such an optimum level of flux density in the outer armature core sections: even if the two such opposite core sections are operated at opposite respective polarities.

Detailed Calculations for Preferred Embodiment

It is important to note that all of the underlying specifications pertaining to the size and/or positioning of Primary Power System components located within the hull's neutral section region (or "Neutral Ring") are given in terms of fractional increments of the hull radius (R.sub.h) and/or the radial width of the Neutral Ring (C.sub.v -C.sub.a). This means that these components may be easily scaled in exact proportion to the hull, for any selected radius thereof, with no significant error or modification. However, an upper limit of vessel size utilizing the technology represented by the EDF Generator probably exists at a hull diameter not greatly above 100 feet, due to inordinate DC Field Voltage concerns (as that voltage is calculated using the method below).

Table of Dimensions Hull Radius = R.sub.h Hull Volume Constant (C.sub.v) ##EQU1## Hull Area Constant (C.sub.a) C.sub.a = 0.012919C.sub.v Drive Ring Radius (r.sub.f) r.sub.f = 2C.sub.v Emitter Ring Radius (r.sub.neg) r.sub.neg = C.sub.v + C.sub.a Neutral Ring Radius (r.sub.neut) r.sub.neut = C.sub.v - C.sub.a Field Hub Radius (r.sub.z) r.sub.z = 3C.sub.v (Note: R.sub.h = r.sub.f + r.sub.z) Polar Hull Constant (h.sub.z) h.sub.z = 0.1421245r.sub.z Polar Volume Differential (X.sub.h) ##EQU2## Radial Hull Constant (R.sub.s) R.sub.s = h.sub.Z + X.sub.h Area of Positive Zone (A.sub.z) A.sub.z = 2.pi.R.sub.s h.sub.z Area of Negative Section (A.sub.n) ##EQU3## ##EQU4## C = 2.pi.R.sub.h, and c = 2.pi.(R.sub.h - (C.sub.v + C.sub.a)), and

The variable `.alpha.` equals the displacement angle of the Emitter Ring negative sections (with respect to the hull's horizontal centerline plane), which is preferably 7.5.degree. to 8.degree. each. ##EQU5##

Field and Rotor Voltages

Part A: Model Unit Field Intensity

[1] The Marginal Envelope DC Field Intensity for all EDF Generator models regardless of type should be equal to the breakdown dielectric strength of air or vacuum at 3 million (3.times.10.sup.6) volts/meter, as measured along a full pure semicircular arc drawn from the center point on the surface of either hull Positive Zone (5) to any exterior point on the vessel's design hull configuration which lies on the horizontal centerline plane thereof. This distance shall be referred to as the "Drive Field Perimeter" (141), as shown in FIG. 11, and is taken to represent the longest continuous DC field current trajectory.

[2] For purposes of these Specifications, the "Drive Field Boundary" (142) shall represent the distance measured along a full pure semicircular arc from any point on the outer peripheral edge

of either hull Positive Zone (5) to the closest point thereto which lies on the inner peripheral edge of the vessel's corresponding negative hull section (3) (as shown in FIG. 11), and is taken to represent a shortest such DC drive current trajectory.

Part B: Thermal Power Units

[1] The Nominal Field Voltage (nom.V.sub.f) should be numerically equal to 1.5 million (1.5.times.10.sup.6) times the vessel R.sub.h as measured in feet. This value is also equal to the Thermal Unit's standard design Primary Voltage Expansion Ratio of 750 times its Specification DC Primary Array Voltage, as a function of the charge stored within the Primary Power System's two Field Ballast Capacitors and of the Unit's primary cathode emissivity.

[2] The Specification Field Voltage (spec.V.sub.f) should be equal to the Marginal Envelope DC Field Intensity times the distance comprising the Drive Field Perimeter, or (as presently calculated under the above directive) 0.9666 times the Nominal Field Voltage. This value shall constitute the Unit's standard operating value of field envelope voltage.

[3] The Peak (design operating maximum) Field Voltage (max.V.sub.f) shall be equal to 110% of the Specification value thereof, and should never be exceeded in operation.

[4] The Nominal Rotor Voltage (nom.V.sub.r) would be numerically equal to one-third the product of 1,000 (1.times.10.sup.3) times the vessel R.sub.h, as measured in inches, as a gauge of the basic full-power DC generator value of rotor rotational speed, in a `single-stage` device.

[5] The Specification Rotor Voltage (spec.V.sub.r) should be numerically equal to 0.25776% of 1.5 million (1.5.times.10.sup.6) times the vessel R.sub.h as measured in feet, and is also equal to 0.9666 times the Nominal Rotor Voltage. This value would constitute the standard operating value of DC rotor voltage, as a function of the engineered Primary Power System output at a nominal design rotor rotational speed.

[6] The Peak (design operating maximum) Rotor Voltage (max.V.sub.r) shall be equal to 110% of the Specification value thereof, and should likewise never be exceeded.

[7] The Specification DC Primary Array Voltage (spec..DELTA.V.sub.p) will be equal to half (1/2) of the Specification Rotor Voltage, and affects all primary array electrode spacings.

Part C; Impulse Drive Units

Unlike the case with Thermal Power Units, it is not possible to specify in one step a Nominal Field Voltage for Impulse Drive Units which is a linear function of the hull radius R.sub.h ; the DC Field Voltage which must be produced to achieve the chosen design goal for net linear thrust output, equal to five-thirds the Earth's pull of gravity, is jointly proportional to the rotor ampacity which rises as a function of the square of increases in R.sub.h and to the vessel weight (which rises as a function of the cube of R.sub.h increases).

Therefore, a Marginal Field Voltage is initially to be computed for Impulse Drive Units which reflects a projected theoretical operating value of DC Field Voltage required to produce a vessel acceleration approximately equal to 1.67 `g` outside of a proximal gravity field. This Marginal Field Voltage is to be calculated using the "specific impulse" of the vessel concerned (in nt-sec), and for purposes of the application contemplated herein this term is hereby defined as being equal to five times the vessel weight (in newtons) divided by the rotor ampacity times the number of electrons per coulomb.

[1] Accordingly, the Marginal Field Voltage shall then be equal to the Unit's specific impulse (F.sub.dt) times the speed of light (c) divided by the unit electron charge (q).

[2] An estimated nominal Field Voltage will also be computed whereby a nominal value for the final electron speed of Drive Field current is assigned which is in fact a linear function of R.sub.h, as applicable to vessels of from 4 to 100 ft. in diameter only.

[3] The Nominal DC Field Voltage (nom.V.sub.f) should then be equal to the simple average of the Marginal Field Voltage and the said estimated nominal Field Voltage.

[4] The Specification Field Voltage (spec.V.sub.f) should equal the Nominal DC Field Voltage (nom.V.sub.f) divided by an assigned engineering design constant equal to 0.982826.

[5] The Peak (design operating maximum) Field Voltage (max.V.sub.f) shall be equal to 110% of the Specification value thereof, and should never be exceeded in operation.

[6] The Nominal Rotor Voltage (nom.V.sub.r) would be numerically equal to one-fourth the product of 1,000 (1.times.10.sup.3) times the vessel R.sub.h as measured in inches, as a gauge of the basic full-power DC generator value of rotor rotational speed, in a `three-stage` device.

[7] The Specification Rotor Voltage (spec.V.sub.r) should be numerically equal to 0.19332% of 1.5 million (1.5.times.10.sup.6) times the vessel R.sub.h as measured in feet, and is also equal to 0.9666 times the Nominal Rotor Voltage. This value would constitute the standard operating value of DC rotor voltage, as a function of the engineered Primary Power System output at a nominal design rotor rotational speed.

[8] The Peak (design operating maximum) Rotor Voltage (max.V.sub.r) shall be equal to 110% of the Specification value thereof, and should likewise never be exceeded.

[9] The Specification DC Primary Array Voltage (spec..DELTA.V.sub.p) will be equal to half (1/2) of the Specification Rotor Voltage, and affects all primary array electrode spacings.

[10] The design Primary Voltage Expansion Ratio for each Impulse Drive Unit should then be equal to the ratio of Specification Field Voltage to Specification DC Primary Array Voltage, and is once again a function of the ballast capacitor charge and of the primary cathode emissivity as in the case with Thermal Power Units.

Example of Specific Unit Voltage Values

Four-foot diameter model

Section A: Thermal Power Units

A 4 ft. EDF Generator constructed for use as a Thermal Power Unit would have specific Rotor and Field Voltages, according to the preceding instructions, as follows:

[1] The Nominal Rotor Voltage (nom.V.sub.r) will be equal to 8,000.

[2] The Specification Rotor Voltage (spec.V.sub.r) will be equal to 7,732.8.

[3] The Spec. DC Primary Array Voltage (spec..DELTA.V.sub.p) will be equal to 3,866.4.

[4] The Nominal Field Voltage (nom.V.sub.f) will be equal to 3,000,000.

[5] The Specification Field Voltage (spec.V.sub.f) will be equal to 2,899,800.

The corresponding Primary Voltage Expansion Ratio (for this and any single-stage Thermal Power Unit) will thus be 750:1, and in this case is equal to 2,899,800/3,866.4.

Section B: Impulse Drive Units

A 4 ft. diameter three-stage-rotor EDF Generator constructed for use as an Impulse Drive Unit would have specific Rotor and Field Voltages, according to the preceding instructions, as follows:

[1] The Nominal Rotor Voltage (nom.V.sub.r) will be equal to 6,000.

[2] The Specification Rotor Voltage (spec.V.sub.r) will be equal to 5,799.6.

[3] The Spec. DC Primary Array Voltage (spec..DELTA.V.sub.p) will be equal to 2,899.8.

[4] Marginal Field Voltage: The 4 ft. Drive Unit's Marginal Field Voltage, which represents a projected minimum standard operating value of field envelope voltage, is based upon the vessel's specific impulse (F.sub.dt)--given its calculated design rotor ampacity of I.sub.max =38,160 amps and estimated weight of 79.2 lbs/ft.sup.3 -- which is computed as follows: ##EQU6##

where V.sub.t = 2.5068 ft, as calculated by the formulas in the Table of Dimensions above using an Emitter Ring displacement angle (.alpha.) of 7.5.degree.. Therefore, ##EQU7##

Therefore, the Marginal Field Voltage is equal to: ##EQU8##

[5] Estimated Nominal Field Voltage: The 4 ft. Impulse Drive Unit's estimated nominal field voltage, which represents an alternate but extremely accurate projection of the minimum standard operating value of field envelope voltage, is based upon a nominal value for the final electron speed of Drive Field current (.DELTA.V.sub.e) which is an assigned linear function of the vessel R.sub.h and is calculated as follows:

where R.sub.h is in feet, for vessels from 4 to 100 ft. in diameter.

Therefore, .DELTA.V.sub.e = [0.999+0(1.03125.times.10.sup.-5)]c = 0.999 c.

The purpose of this text subsection is to verify that a goal-requisite level of Field current thrust may be produced by the Electrodynamic Field Generator, at an operating DC Field Voltage approximately equal to that stated above, within the ampacity of the rotor and at an assigned value of Field current electron velocity (for this model) equal to 0.999c. In this manner, it is hoped that unnecessarily high operating Drive Field Voltage may be avoided, by virtue of design (due to the finite level of unavoidable uncertainty in the relativistic values involved), without sacrificing device performance.

(a) The amount of thrust (force) required to produce an acceleration of 1 g, thus exactly compensating the weight of the Impulse Drive Unit or its normal acceleration due to Earth's gravity, may be calculated by Newton's Second Law as follows:

F = mg, where m = est. design mass* of 90.245 kg, and g = 9.8 m/sec.sup.2.

Thus, F = 884.4 nt.

(b) Since impulse equals change of momentum, the electron thrust developed by the Drive Field equals the total relativistic mass of Field current times the incident current velocity (as the final electron velocity equals zero). The amount of impulse thrust which is equivalent to 1 g in this example is 884.4 nt.

Therefore, let .SIGMA.M.sub.t.DELTA.V.sub.e = 884.4 nt.

(c) The design goal for net linear thrust output of any given Impulse Drive Unit is 16.333 m/sec.sup.2 at the minimum standard operating value of Field Voltage and rated rotor ampacity (I.sub.max) Therefore, given the considerations of Field Current Bias values (as were outlined in an earlier section), total isometric thrust at Marginal Field Voltage must equal 5 g. The largest current available to effect a Field impulse equivalent to 1 g is then equal to:

(d) Since .SIGMA. equals the total number of electrons comprising a Drive current of I.sub.g, we find:

(e) Therefore, from [b] above:

(f) Letting .DELTA.V.sub.e = 0.999c, where c = 299.7925.times.10.sup.6 m/sec, we calculate M.sub.t = 619.08.times.10.sup.-31 kg, or about 67.96 m.sub.o, where m.sub.o = the electron rest mass of 9.11.times.10.sup.-31 kg.

(g) If m.sub.i equals the relativistic mass equivalent of the gained kinetic energy of each Drive Field electron, then M.sub.t = m.sub.o +m.sub.i.

Therefore, m.sub.i = M.sub.t -m.sub.o = 619.08.times.10.sup.-31 -9.11.times.10.sup.-31 = 609.97.times.10.sup.-31 kg.

(h) Each Drive Field electron's gained kinetic energy (E.sub.q) equals m.sub.i c.sup.2. Using a precise value of 8.98755.times.10.sup.16 for c.sup.2,

we obtain E.sub.q = (6.0997.times.10.sup.-29) (8.98755.times.10.sup.16) = 54.8214.times.10.sup.-13 joules.

(i) Here, E.sub.q also equals W = q(est.V.sub.nf), where q = electron chg. @1.6.times.10.sup.-19 coul., and est.V.sub.nf = est. nominal Field Voltage.

Therefore, E.sub.q /q = est.V.sub.nf, and est.V.sub.nf =34.2633.times.10.sup.6 volts (jouleslcoul).

Thus, we find that the estimated nominal Field Voltage required to develop requisite thrust is in fact well within the thrust goal parameters discussed above, at 98.63% of the projected Marginal value (calculated in the preceding subsection B[4]).

[6] The Nominal DC Field Voltage (nom.V.sub.f) should therefore be equal to the simple average of the Marginal Field Voltage projected earlier and the estimated nominal Field Voltage Oust computed), at 34.5018.times.10.sup.6 volts.

[7] The Specification Field Voltage (spec.V.sub.f) should then be equal to the Nominal DC Field Voltage divided by the said design constant 0.982826, at 35.1047.times.10.sup.6 volts. This value shall constitute the Unit's standard operating value of field envelope voltage.

[8] The design Primary Voltage Expansion Ratio for this model Impulse Drive Unit is therefore equal to (35.1047.times.10.sup.6)/2,899.8=12,106:1, as was referred to earlier.

From the foregoing description it will be observed that the present invention provides a remarkable level of electrical and thermal output in a lower-voltage corona discharge induction embodiment, which is intended for use in a utility or physical plant application. However, this invention also provides the potential for an appreciable level of net impulse thrust in a higher-voltage arc discharge induction embodiment intended as an electrically-propulsive aerospace vessel. It can be seen as well that the Electrodynamic Field Generator and the electromotive field of force produced thereby will moreover fulfill the stated objective of NASA's premier Breakthrough Propulsion Physics Program: to discover a method whereby "a vehicle can create and control an asymmetric force on itself without expelling a reaction mass" and which satisfies conservation laws in the process. Such a vessel could perhaps be made to attain a velocity commensurate with its collector field electron collision velocity, and affords hope that true interstellar travel might therefore become possible as well. While there is due cause for some concern as to the EDF Generator's production of high-frequency radiative emissions coincident with its production of heat and impulse thrust using the new means described, it is postulated that the electromagnetic characteristics of the device's field envelope can be suitably tuned in the manner(s) oulined hereinabove such that the field envelope is rendered largely opaque to such very-high-energy emissions -- by promoting continuous and adsorptive Compton effect interactions thereof with the field's impinging drive current electrons. When used in association

with a ground-based utility or physical plant, a non-propulsive thermal and/or electrical power output model of the Generator may also be enclosed within a suitable Faraday "cage" or shielding structure to further minimize radiative emissions which are undesirable. Neverthless, the said field envelope tuning principles (related to controlling the amplitude, frequency, and/or phase relationships amid field AC voltage components) may moreover permit the development of the Electrodynamic Field Generator as a novel signal communications means. In pursuit of a new and more complete quantum gravity theory, experiments may be conducted involving the gravimetric coupling of two or more separate such devices: whose field envelopes will by design be able to exhibit a relativistic and oscillatory apparent mass effect that is artificially generated--at desired resonant frequencies -- by using alternating electromagnetic induction methods of the type described hereinabove to modulate electrodynamic field properties which are normally of constant polarity and magnitude or random frequency.

Accordingly, it is to be understood that the embodiments of the invention herein described are merely illustrative of the application of the principles of the invention. Reference herein to details of the illustrated embodiments are not intended to limit the scope of the claims, which themselves recite those features regarded as essential to the invention.

Henry WALLACE Kinemassic Force Field

Counter-rotating masses of half-integral spin nuclei material (i.e., copper, zinc, lead, tin, nickel, vanadium, arsenic, gallium, &c) generate a "kinemassic force field" that can be used to work against ambient gravity. Wallace received 3 patents for his discovery.

New Scientist **(14 February 1980) : "Anti-Gravity Not So Crazy After All"**

Henry W. Wallace : "Concerning Mass Dynamic Interactions" (31 January 1983)

US Patent # 3,626,605 : Method & Apparatus for Generating a Secondary Gravitational Force Field

US Patent # 3,626,606 : Method & Apparatus for Generating a Dynamic Force Field

US Patent # 3,823,570 : Heat Pump

R. Stirniman : The Wallace Inventions (PDF)

New Scientist **(14 February 1980)**

"Antigravity Not So Crazy After All"

It is now nearly 10 years since Henry Wallace was granted a pair of US Patents (# 3,636,605 and 606) on what was initially written off as a crazy science fiction notion --- a machine to generate an anti-gravity field. But in the interim, Professor Eric Laithwaite of Imperial College, London, has achieved both fame and notoriety by arriving independently at a similar theory.

According to Wallace's patents, bodies made of carefully chosen materials generate an energy field when placed in rapid relative motion. This field is not electromagnetic and was christened by the inventor as a Kinemassic Forcefield. If this kinemassic field is made to undulate, a secondary gravitational field is produced which can neutralize gravity.

In one kinemassic machine a pair of wheels of brass alloy, like gyroscopes, are mounted in close-fitting air gaps between massive structural supports formed from steel. The wheels are driven to a high speed of rotation by jets of compressed air or nitrogen. The inventor claims that, at speeds of about 20,000 rpm, polarization of the spin nuclei of the alloyed metal occurs. If one wheel is balanced on a knife edge, it will start to oscillate under the influence of the other. If the spinning wheels are rotated abut another axis, a secondary gravitational field is created which reduces the wheels' weight. If a sufficiently strong field is created, it can generate localized areas of gravitational shielding and thus provide an effective propulsion force.

Although the Wallace patents were initially ignored as cranky, observers believe that his invention is now under serious but secret investigation by the military authorities in the USA. The military may now regret that the patents have already been granted and so are available for anyone to read.

Henry W. Wallace:
"Concerning Mass Dynamic Interactions"
(31 January 1983)

Based on the assumption of your interest, following are descriptive explanations of two of the many facets of the kinemassic field force (KF) energy: one micro, the second, macro in form. Acquainting you with just the first (micro) of these facets, I believe, will establish the reality of the KF to you although other facets --- in addition to these two --- convincingly exist not the least of which are the quantitative test data associated with, for example, the KF permeability experiments.

Einstein believed that a force field could be generated from the mass dynamic interaction of bodies in relative motion. Quoting from the *Encyclopedia Britannica* (15th Ed., Macropedia, Vol. 8, p. 289): "Field theories of gravity, Einstein's general relativity being an important example, also predict specific corrections to the Newtonian force law, the corrections being of two basic forms: (1) When matter is in motion, additional gravitational fields (analogous to the magnetic fields produced by moving electric charges) are produced; also, moving bodies interact with gravitational fields in a motion-dependent way...". Sometime after Einstein's death, this predicted field --- a mathematical expression --- was posthumously termed "protational". Einstein was said to have been distressed that, experimentally, this predicted force field energy apparently could never be realized --- and therefore verified --- since calculations indicated that the maximum mass densities of available hardware, needed for "matter in motion" (mass

dynamic interactions), would hypothetically generate field forces so infinitesimal as to be many orders of magnitude below measurable levels. Platinum (Pt) --- with a density of p = 21.45 gm/cm^3 --- was thought to be the most viable hardware candidate.

The KF reasoning is quite clearly believed to have stolen a march upon the existing field theories of gravity; a march of utmost importance regarding concepts of experimental hardware. This preceding statement especially applies to the maximal attainable density needed for the measurable interaction of "matter in motion"; the neutron possesses, for example, a density of close to 3.5 x 10^14 gm/cm^3.

Quoting again from the *Ency. Brit.* (Special Suppl. 1976 Brit. Book of the Year, p. 62) as regards awarding of the 1975 Nobel Prizes, L. James Rainwater, one of three Nobel laureates for Physics that year, wrote a paper associated therewith of which the following excerpt applies: "...observed that the greater potion of nuclear particles form an inner nucleus while other particles, which are all in constant motion at tremendous velocities, affect the other set of particles...". For reasoning which is not included here but which is set forth in US Patents # 3,626, 605 and # 3,626,606, the KF moment of the odd-A nuclide's unpaired nuclear particle (either proton or neutron) possesses its salient KF force energy moment --- the same energy interaction ongoing between the nuclear, shell-configured particles just quoted from L. J. Rainwater --- available for experimental measurement by means of, for example, the various apparatus described in these two basic patents.

Consider the magnitudes of density enhancement between the nucleon (N) --- e.g., neutron (n) --- and platinum (Pt):

$3.5 \times 10^{14} / 2.145 \times 10^{1} = 1.6 \times 10^{13}$

In order to more emphatically portray this thirteen orders of magnitude increase in density, one may compare 30 million years with one minute of time. The unpaired N, collectively, of the odd-A nuclide is the viable hardware available for experimentally measuring the interaction of... matter in motion... as regards the KF force energy.

Although it is an extreme example, a 100-pound bar of beryllium (Be) possesses 11.1 pounds of unpaired nuclear particles interacting, in part, with an additional 11.1 pounds of paired nuclear particles --- via mass imagery. Consequently, 22.2 pounds of spinning, orbiting, vibrating particles --- "all in constant (relative) motions at tremendous velocities..." and with particles densities in the order of 3.5×10^{14} gm/cm^3 --- are available in laboratory apparatus where 100 pounds of Be are utilized. It is noted that Be should preferably be utilized within the apparatus of USP # 3,636,605 since Be's nuclear relaxation time --- from its polarized state --- may be of several day's duration; Be may well have valuable future application comparable to certain metallic elements, and their alloys, utilized for permanent magnet structures within the realm of electromagnetism.

Because these unpaired nucleons, of the odd-A nuclides, possess external angular momenta (the respective momenta of paired nucleons internally cancel), it has experimentally been determined that the imposing of an applied axis of rotation to odd-A nuclide matter causes spin polarization such as occurs with the Barnett Effect concerning the spins of unpaired electrons within ferromagnetic matter. The means, therefore, are at hand for generating a KF force as the Barnett Effect apparatus has been available for generating a magnetomotive force (mmf).

The KF force moment, by itself, has not yet proven sufficiently energetic, however, to be capable of generating, en masse, a measurable KF field by this imposed axis of rotation technique. Unlike the concept and apparatus, utilized in the Barnett Effect, the field enhancement method of

adding the parameter of KF permeability --- by means of field circuit structure fabricated of odd-A nuclide matter --- created a KF intensity of sufficient magnitude for unpaired N polarization and, hence, for measuring with a resulting accuracy, as determined by probability standards (where any ratio achieving a value of 20:1 is not a result of false test readings) of one billion to one.

Regarding field permeability, a KF structure which is composed of odd-A nuclide matter --- for example, of aluminum, copper, vanadium, cobalt, etc. --- bears a parallel with ferromagnetic field circuit structures, as respects electromagnetism, in that the former structure is, in part, of unpaired electrons. No doubt that the relatively few people, knowledgeable in the area of nuclear physics, would judge the KF moment, associated with an unpaired nucleon of an odd-A nuclide, too weak (if indeed they accepted the moment's existence --- it constitutes a salient rupture (as defined by KF reasoning) of the atomic nucleus and is believed composed of a component of the nuclear binding force --- to interact with the ambient and near-ambient unpaired nucleons of the adjacent atomic structure. This judgment would be based on the energy-interaction distance capabilities of the strong interaction filed; it is thought to be of the order of 10^{-13} cm. However, this energy ---composed of both the pairing and longer-range binding forces --- has only been measured in the MeV energy range; only 15 KeV is believed necessary --- via KF reasoning --- for interatomic KF moment interaction. This KF moment consists of a modified pairing (short-range) force energy. The binding force, holding this unpaired nucleon within its nucleus, essentially consists of the longer-range force energy.

Whereas the magnitude of the magnetic field --- for a given magnetomotive force (mmf) --- can be increased many thousand-fold by the application of a magnetically-permeable field structure --- ferrites exhibit increases exceeding a factor of 80,000 --- it is presently unknown what the KF increase in magnitude is due to the KF permeability present within various matter for a given KF mmf equivalent. However, this KF magnitude increase has been shown to be manifold from the results of KF permeability tests and KF circuit shunt tests. KF ambient air-gap tests have also demonstrated the preference of the KF for odd-A nuclide matter in contrast to vacuum, air and even-even nuclide matter; a KF probe has measured diminishing KF energy, up to 11.5 cm away from an experimental apparatus's field circuit air-gap, in proportion to distance from the air-gap, during Qualitative Testing.

The preceding paragraphs, then, provide a descriptive explanation of those experimental techniques which make it possible to incorporate and utilize matter in laboratory apparatus --- for generating mass dynamic interactions --- with densities some 1.6×10^{13} times greater than thought possible by Einstein and others.

As this KF explanation evolves from the micro to the macro condition, it is appropriate to note that matter possesses two properties germane to this writing. There are two mass properties related to all matter: the quiescent property of weight and the dynamic property of inertia. The weight property relates to the gravitational mass since the mass of a body is regarded as the generator of the gravitational field. The inertial property is that property of a body by which the body will remain at rest, or in the same straight line or direction, unless acted upon by some external force. When that external force action is applied, an equal and opposite force reaction concomitantly occurs, as conceived by Newton. According to KF reasoning, this inertial property exists because of the KF presence, and this force reaction is the force reaction of the secondary, time-variant gravitational field induced by the kinemassic field made time-variant.

The macro presence of the KF, in contrast to the micro presence --- the latter as taught in the two US Patent publications referred to above --- has its awareness emerge from the following

quotations found in the 4th edition of *Van Nostrand's Scientific Encyclopedia*, as follows: "Mach Principle --- The inertial property of matter is a measure of the total matter in the universe and its total relative motion, the kinemassic field being the universal field stress medium required for the communicating of, and for the inherent presence of, this inertial property. Accordingly, when in its inertial state, a body's kinemassic field is unvarying with time but, in its accelerative state, a body's kinemassic field is time-variant, and so gives rise to an induced, time-variant, secondary gravitational field which exhibits its presence as a vector force in opposition to the body's acceleration as defined by Newton's Laws of Motion".

Consider the following example of the macro KF in which it would seem --- per the Mach Criterion --- to be contrary to the methodicalness of Nature for the KF not to be present: Release a one-pound hardened steel ball which is suspended 10 feet above a hardened steel plate --- the two bodies having a mutual Coefficient of Restitution of 90% --- thus the steel ball rebounds to a height of 9 feet above the plate. Our present acceptance of physics recognizes the following statements to be true: While statically suspended, the ball possesses 10 foot-pounds of energy because of the gravitational field; when released, the ball is in a state of acceleration and, because of this, is in the process of transforming it gravitational potential energy into kinetic energy; at the precise moment of impact between ball and plate, the ball has completed this energy transformation with almost 100% efficiency; after impact, elastic deformations of ball and plate occur; because of the 90% Coefficient of Restitution, there exists 0.9 x 10 ft lb, or 9 foot-pounds, of conservative potential energy stored within the maximally deformed ball-plate system; this potential energy storage is possible because of the stressing of the electromagnetic fields responsible for the crystalline structural integrity of solid matter; as the ball, in its rebound state, just clears the plate surface, the electromagnetic field potential energy storage is mostly transformed to kinetic energy (the total non-conservative energy transformation of one foot-pound appears as thermal energy loss which results in a temperature increase within ball and plate); immediately, the kinetic energy begins an energy transformation back into 9 foot-pounds of gravitational field potential energy, the cycle completing itself only when the ball and plate separate to a 9-foot distance.

The point that is made here concerns the relationship between energy states and the energy fields associated wth these energy states during this cycle of energy transformations. Kindly note: of all these energy states, only the kinetic energy state has no inherent, essential field associated with it, according to the current teachings of physics. This unrecognized field, this missing link, this source of an empty niche, the filling of which is required for energy/field symmetry, a field needed for both rational and linear kinetic energies --- if Nature's orderliness is to be kept --- is the kinemassic field.

In accordance, then, with that KF statement --- in part, similar to the Mach Principle noted above --- when a body is in its inertial sate, only the kinemassic field is present: however, when a body is in an accelerative state --- including linear acceleration, angular velocity (radial acceleration), and angular acceleration --- the kinemassic field becomes time-variant thereby inducing an associated, secondary, time-variant gravitational field as well.

Although straight-line motions and linear velocities are taught as acceptable states of matter, these concepts may prove to be a handicap in truly understanding Nature since the earth continually accelerates towards the sun which, in turn, is in a continuing state of acceleration towards the center of our nebula which, in turn, is in a state of deceleration with respect to the expanding universe. A path or ray of light could be considered not to represent a straight line due to the gravitational field gradients filling space. No orbit is truly circular. The warped deviations of the near-ellipsoidal orbits of earth satellites tells us much about the earth's pear-shaped

configuration. And so it may be reasoned that so-called straight lines, or curved displacements, are, in reality, extreme examples of curved lines, or curved displacements, possessing near-infinitely long, and curvy, radii; correspondingly, bodies traveling at extremely miniscule accelerations respectively. A geodesic line is the path followed by a particle upon which only gravitational and inertial forces act. An example of such a path is that traveled by a spacecraft towards the outer regions of out planetary system. Such a path is te straightest path possible in a 4-dimensional space-time continuum.

Before reviewing the main thoughts expressed in this writing, it seems that further clarification should be given regarding acceleration of matter by various means.

A distinction is made as to the several modes available for the accelerating of mass according to gravitational field theories and hypotheses. The equivalence Principle is stated in several ways but its essence teaches that the greater the weight property, of one body to another, the proportionately greater is the inertial property of the first body to the other. Hence all bodies, great and small, accelerate equally within the same gravitational field gradient. Qetvos first demonstrated this principle experimentally. Currently this equivalence has been found to hold true to the eleventh order of magnitude.

If matter is accelerated by electromagnetic fields --- both static and DC magnetic fields included --- it is regarded as in its accelerated state. But if matter is accelerated by the gravitational field, theories consider that it remains in its inertial states of rest or translation although, if such matter were released above the surface of the earth at our approximate latitude, bith it and the earth would acclerate towards one another at a combined acceleration of 32.17 ft/sec^2.

Kinemassic field reasoning provides for accelerated relative motions even though two bodies are, for example, in translatory motions of constant velocities. Therefore a body may be at rest in its relationship to the motion-averaging of universal relative motion --- with respect to that spatial matter, still within KF communication either because of the curvature of space or, alternatively, because of not exceeding the velocity, viz., of electromagnetic propagation --- but still be in an accelerative state of motion with respect to a local second body which also is in its inertial rest state also with respect to inertial space. Bodies, in these so-called inertial states --- although experiencing distinct local relative motions --- are reasoned to be centered within the sphere of the universe's total relative motion. This concept is more easily grasped if the inertial state is that one of rest. Here the vector summation, of this total relative motion, is zero, when measured by an observer located at the position of the sphere-centered body in its rest state, as would the gas molecules within a gas-filled chamber when the chamber is held at a zero temperature gradient. When in its inertial state of translation, the body remains sphere-centered because of the curvature of space as a mite would remain centered on the surface of a sphere, as it moved about in an imaginary, so-called 3-dimensional universe of space-time.

One final distinction is presently worth citing. The same edition of *Van Nostrand's Scientific Encyclopedia* earlier referenced (p. 973), under Gravitation and Gravity: "Einstein's Equivalence Principle makes no distinction between gravitation and centrifugal force...". Providing this statement is quoted correctly by Van Nostrand, then a further difference exists between this field theory of gravity and the KF reasoning in the respect that the KF reasoning makes a distinction between the gravitational field force and the centrifugal/ centripetal force pair arising from radial acceleration: this distinction concerns the differences in the characteristics of the two force gradients. For all practical purposes, the earth's gravitational field force gradient diminishes exponentially --- to the second power --- as elevation is gained along a local vertical above the

earth. The centrifugal force, acting on a spinning body's particles, diminishes linearly along a radial line of approach to the body's axis of rotation.

In review then --- as regard the macro state of the KF from an inertial point of view --- all matter is in an accelerative state of universal relative motion. Consequently, when based on the foregoing reasoning, the kinemassic field is everywhere, in its time-variant state, continuously inducting tie-variant gravitational fields. The kinemassic field provides the explanation for, and is the cause of, the inertial property of matter. When matter is accelerated --- that is: when the kinemassic field is made time-variant --- this time variance causes induction of a secondary, time-variant gravitational field; its physical presence is mechanically felt as that F = Mdv / dt force reaction so well expressed by Newton's second and third laws of motion as stated by Harvey E. White in *Classical and Modern Physics*: Second Law --- The rate at which momentum of a body changes is equal to the force acting and takes place in the direction of the straight line in which the force acts. Third Law --- "to every action force there is always an equal and opposite reaction force".

Briefly, in closing, unpaired nucleons are reasoned to not only possess spin axes and magnetic moments but also kinemassic moments . This hypothesis seemingly is borne out by the actual testing of polarized odd-A nuclide matter, in which field forces --- probed/sensed up to 11.5 cm from the apparatus' field circuit test air gap --- were measured and determined not to be of electromagnetic or gravitational energies. Because these bodies of matter are 1.6×10^{13} more dense than platinum and because their mass dynamic interactions are comprehended as naturally occurring within atomic nuclei, the measuring of such matter interactions within experimental laboratory apparatus was deemed worth trying to measure. The important concept of field permeability was incorporated within the apparatus and, as was experimentally verified, success depended upon the utilization of permeable field circuit structure in order to provide sufficient field enhancement for detection and measurement. This micro KF then is to be identified in its macro form and, as briefly reviewed in the preceding paragraph, provides the surprising insights that the inertial forces of mass acceleration arise from induction of a secondary gravitational field via a time-variant kinemassic field, the kinemassic field providing the inertial property of matter.

US Patent # 3,626,605

Method & Apparatus for Generating a Secondary Gravitational Force Field

Henry W. Wallace

December 14, 1971
US CL. 35-19

Abstract -- Apparatus and method for generating a time variant non-electromagnetic force field due to the dynamic interaction of relatively moving bodies through gravitational coupling, and for transforming such force fields into energy for doing useful work.

Description

The method for generating such time variant force fields including the steps of juxtaposing in field series relationship a stationary member of spin nuclei material, and a member capable of assuming relative motion with respect to said stationary member also characterized by spin nuclei material; initiating relative motion by rotation of said one member with respect to the other, which rotational motion may occur both about an axis within the plane of said other member and about an axis perpendicular thereto; whereby the rotational motion of said one

member about the axis perpendicular to the plane of said other member results in the dual interaction of the angular momentum property of said other member thereby resulting in a dynamic interaction field arising through gravitational coupling which dynamic interaction is further characterized by its non-electromagnetic nature and its mass-proximity and relative motion dependency; the rotation of said one member about the axis within the plane of said other interaction field within said other member which in turn gives rise to a secondary time-variant gravitational field in the surrounding space.

The present invention relates to an apparatus and method for generating a time-variant force field due to the relative motion of moving bodies; which force field exhibits itself in the form of an induced secondary gravitational force. As such, this invention constitutes a continuation-in -part of an application field Nov. 4, 1968 by the same inventor, entitled Method & Apparatus for Generating a Dynamic Force Field and bearing Ser. No. 773,116 (US Patent #3,626,606).

In the practice of the present invention it has been found that when bodies composed of certain material are placed in relative motion with respect to one another there is generated an energy field therein not heretofore observed. This field is not electromagnetic in nature; being by theoretical prediction related to the gravitational coupling of relatively moving bodies.

The initial evidence indicates that this non-electromagnetic field is generated as a result of the relative motion of bodies constituted of elements whose nuclei are characterized by half integral "spin" values, the spin of the nuclei being associated with the net angular momentum of the nucleons thereof. The nucleons in turn comprise the elemental particles of the nucleus; i.e. the neutrons and protons. For the purposes of the present invention the field, generated by the relative motion of materials characterized by a half integral spin value, is referred to as a "kinemassic" field.

It will be appreciated that relative motion occurs on various levels, i.e., there may be relative motion of discrete bodies as well of the constituents thereof including, on a subatomic level, the nucleons of the nucleus. The kinemassic force field under consideration is a result of such relative motion, being a function of the dynamic interaction of two relatively moving bodies including the elemental particles thereof. The value of the kinemassic force field created, by reason of the dynamic interaction of the bodies experiencing relative motion, is the algebraic sum of the fields created by reason of the dynamic interaction of both elementary particles and of the discrete bodies.

For a closed system comprising only a stationary body, the kinemassic force, due to the dynamic interaction of the subatomic particles therein, is zero because of the random distribution of spin orientations of the respective particles. Polarization of the spin components so as to align a majority thereof in a preferred direction establishes a flux field aligned with the spin axes of the elementary particles. The present invention is in part comprised of an apparatus for polarizing its spin nuclei material, while additional means are provided to induce an alternating or undulating effect in the kinemassic field so generated.

Accordingly, a primary object of the present invention concerns the provision of means for generating a time-variant kinemassic field within a permeable field body due to the dynamic interaction of relatively moving bodies and the relative motion of said generating means with respect to the permeable field body.

The kinemassic force field finds theoretical support in the laws of physics, being substantiated by the generalized theory of relativity. According to the general theory of relativity, there exists not only a static gravitational field but also a dynamic component thereof due to the gravitational coupling of relatively moving bodies.

This theory proposes that two spinning bodies will exert force on each other. Heretofore the theoretical predictions have never been experimentally substantiated; however, as early as 1896, experiments were conducted on stationary bodies placed near large, rapidly rotating masses. The results of these early experiments were inconclusive, and little else in the nature of this type of work is known to have been conducted.

It is therefore another object of the present invention to set forth an operative technique for generating a measurable time-variant force field due to the gravitational coupling of relatively moving bodies.

In carrying out the present invention, means are provided to enable the relative rotational motion of a first member with respect to a stationary member positioned in close proximity thereto; the construction of one embodiment of the first member being such as to enable portions thereof to assume rotational motion about an axis perpendicular to the plane of said stationary member. The effect of the rotation of said member about the axis perpendicular to the plane of the stationary member is to establish a kinemassic force field in the nature of that referred to in the aforementioned co-pending application of the same inventor. The rotation of said member about the axis lying within the plane of said stationary member results in an undulation of the dynamic interaction field within said field members which in turn induces a secondary time-variant gravitational field in the surrounding space.

Accordingly, another more specific object of the present invention concerns a method of generating a non-electromagnetic force field due to dynamic interaction of relatively moving bodies and for utilizing such force field to further generate a secondary gravitational field.

The foregoing objects and features of novelty which characterize the present invention, as well as other objects of the invention, are pointed out with particularity in the claims annexed to and forming a part of the present specification. For a better understanding of the invention, its advantages and specific objects allied with its use, reference should be made to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

Figure 1 shows an overall view of equipment constructed in accordance with the principles of the present invention, including means to demonstrate the effect of a time-variant kinemassic force field;

[Click to enlarge]

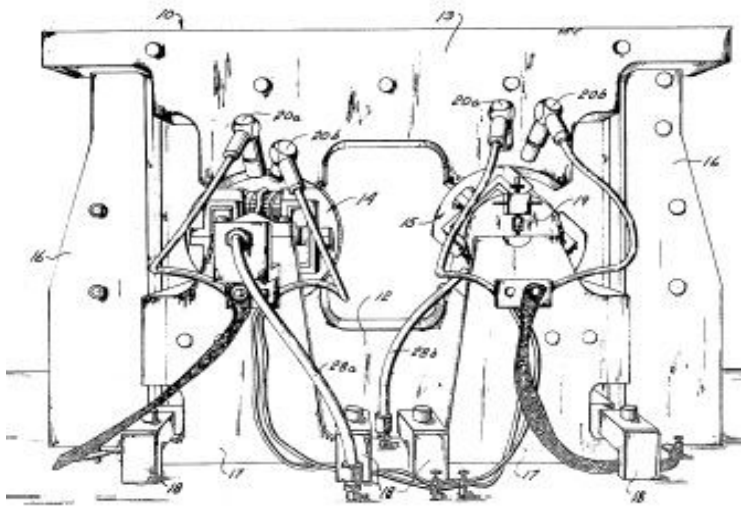


Figure 2 is an isolation schematic of apparatus components comprising the time-variant kinemassic field circuit of Figure 1;

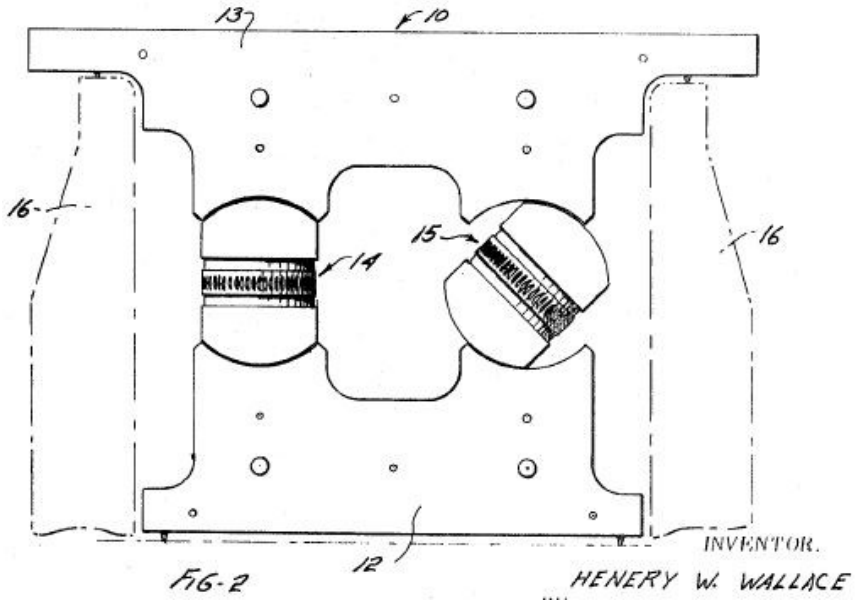


FIG-2

Figures 3, 3A, 3B, 4 and 5 show the details of construction of the generator and detector assemblies of Figures 1 and 2;

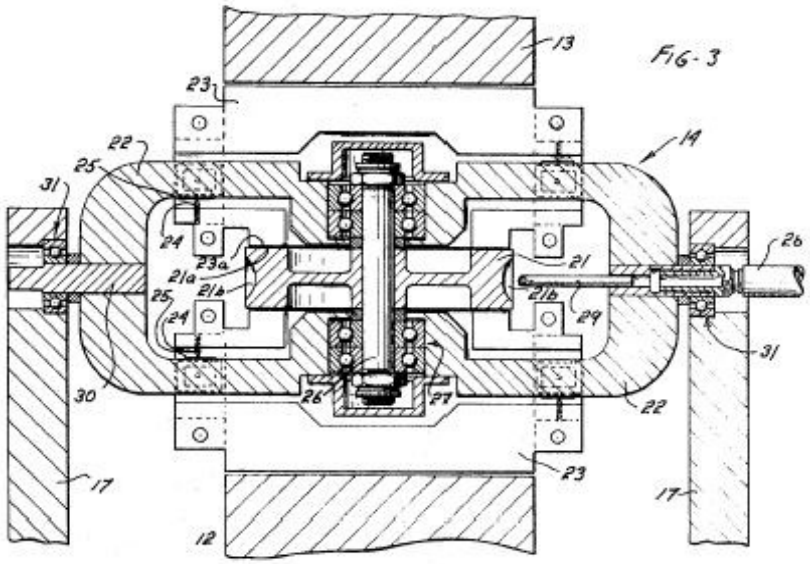


FIG-3

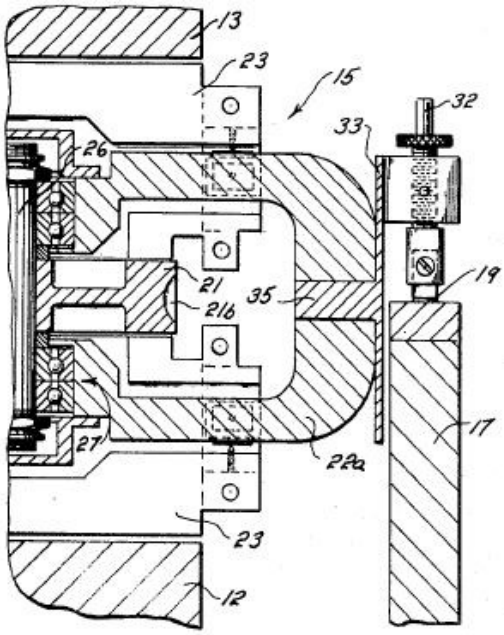


FIG-3A

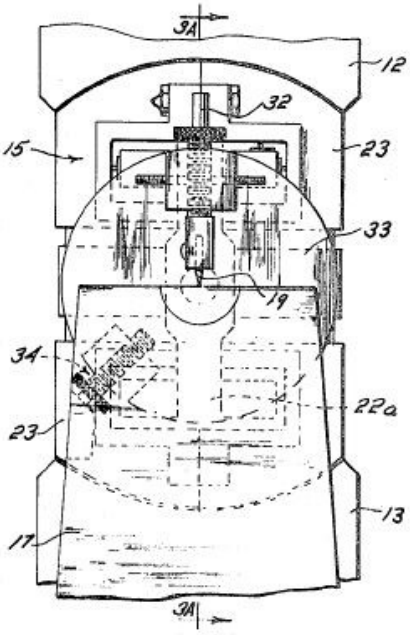


FIG-3B

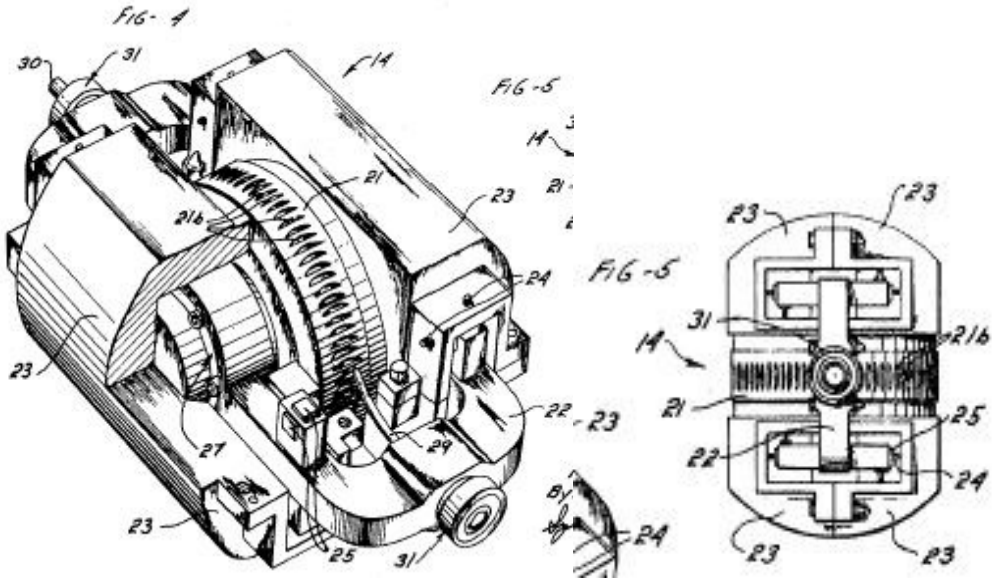
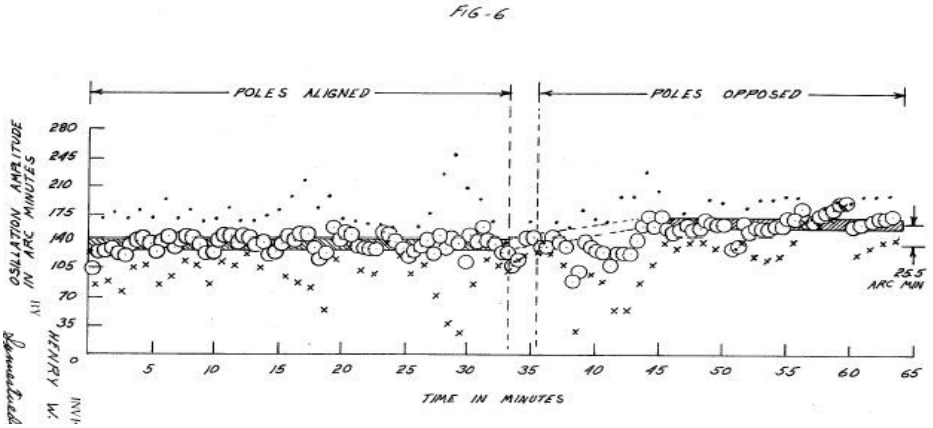
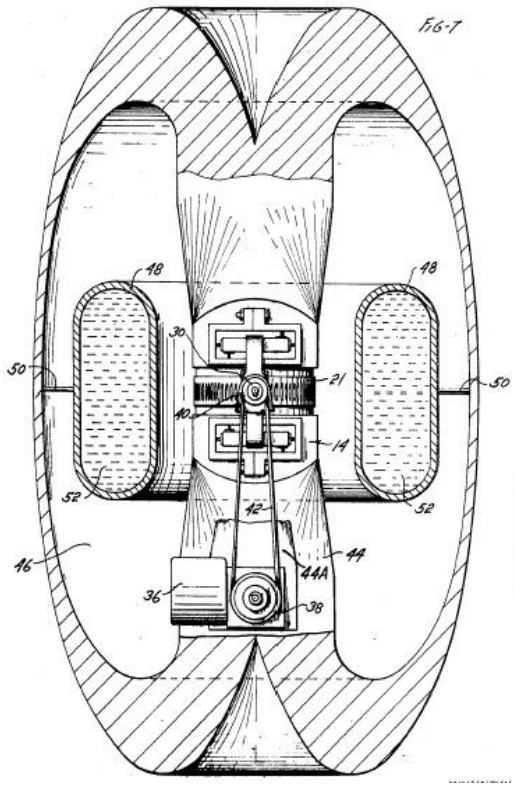


Figure 6 represents measured changes in operating characteristics of the apparatus of Figures 1 and 2 demonstrating the time-variant nature of the kinemassic force field so produced;
[Click to enlarge]



Figures 7, 7A and 7B are sectioned views of various embodiments of the present invention for demonstrating the time-variant nature of the kinemassic force field as used in establishing a secondary gravitational component.
[Click to enlarge]



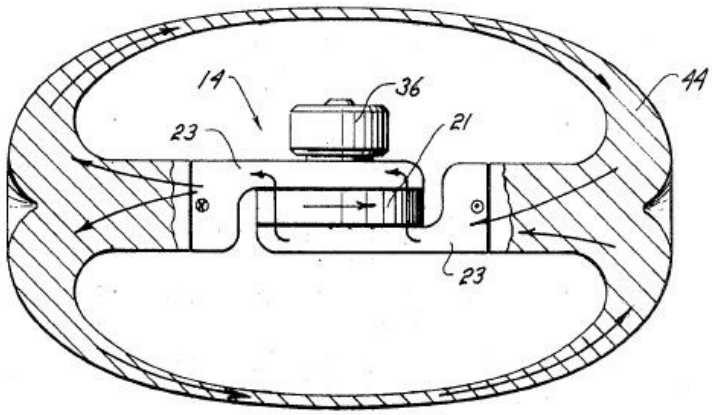


FIG- 7A

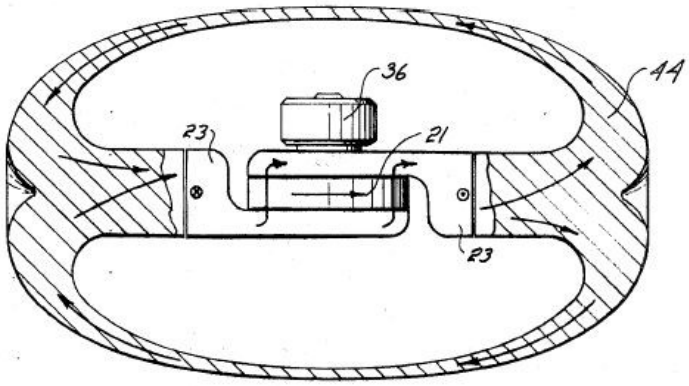


FIG- 7B

Before getting into a detailed discussion of the apparatus and the steps involved in the practice of the present invention, it should be helpful to and understanding if the present invention of consideration is first given certain defining characteristics thereof, many of which bear an analogous relationship to electromagnetic field theory.

A first feature is that the kinemassic field is vectorial in nature. The direction of the field vector is a function of the geometry in which the relative motion between mass particles takes place.

The second significant property of the kinemassic field relates the field strength to the nature of the material in the field. This property may be thought of as the kinemassic permeability by analogy to the concept of permeability in magnetic field theory. The field strength is apparently a function of the density of the spin nuclei material comprising the field circuit members. Whereas the permeability in magnetic field theory is a function of the density of unpaired electrons, the kinemassic permeability is a function of the density of spin nuclei and the measure of magnitude of their half integral spin values. As a consequence of this latter property, the field may be directed and confined by interposing into it denser portions of desired configuration. For example, the field may be in large measure confined to a closed loop of dense material starting and terminating adjacent a system wherein relative motion between masses is occurring.

A further property of the kinemassic force field relates field strength to the relative spacing between two masses in relative motion with respect to one another. Thus, the strength of the resultant field is a function of the proximity of the relatively moving bodies such that relative motion occurring between two masses which are closely adjacent will result in the generation of a field stronger than that created when the same two relatively moving bodies are spaced farther apart.

As mentioned above, a material consideration in generating the kinemassic force field concerns the use of spin nuclei material. By spin nuclei material is meant materials in nature which exhibit a nuclear external angular momentum. This includes both the intrinsic spin of the unpaired nucleon as well as that due to the orbital motion of these nucleons.

Since the dynamic interaction field arising through gravitational coupling is a function of both the mass and proximity of two relatively moving bodies, then the resultant force is predictably maximized within the nucleus of an atom due to the relatively high densities of the nucleons plus the fact that the nucleons possess both intrinsic and orbital components of angular momentum. Such force fields may in fact account for a significant portion of the nuclear binding force found in all of nature.

It has been found that for certain materials, namely those characterized by a half integral spin value, the external component of angular momentum thereof will be accompanied by a force de to the dynamic interaction of the nucleons.

This is the so-called kinemassic force which on a sub-macroscopic basis exhibits itself as a dipole moment aligned with the external angular momentum vector. These moments are of sufficient magnitude that they interact with adjacent, or near adjacent, spin nuclei field dipole moments of neighboring atoms.

This latter feature gives rise to a further analogy to electromagnetic field theory in that the interaction of adjacent spin nuclei field dipole moments gives rise to nuclear domain-like structures within matter containing a sufficient portion of spin nuclei material.

As in electromagnetic field theory, in an unpolarized sample the external components of angular momentum of the nuclei to be subjected to a kinemassic force field are randomly oriented such that the material exhibits no residual kinemassic field of its own. However, establishing the necessary criteria for such a force field effects a polarization of spin components of adjacent nuclei in a preferred direction thereby resulting in a force field which may be represented in terms of kinemassic field flux lines normal to the direction of spin.

The fact that spin nuclei material exhibits external kinemassic forces suggests that these forces should exhibit themselves on a macroscopic basis and thus be detectable, when arranged in a

manner similar to that for demonstrating the Barnett effect when dealing with electromagnetic phenomena.

In the Barnett effect a long iron cylinder, when rotated at high speed about its longitudinal axis, was found to develop a measurable component of magnetization, the value of which was found to be proportional to the angular speed. The effect was attributed to the influence of the impressed rotation upon the revolving electronic systems due to the mass property of the unpaired electrons within the atoms.

In an apparatus constructed in accordance with the foregoing principles it was found that a rotating member such as a wheel composed of spin nuclei material exhibits a kinemassic force field. The interaction of the spin nuclei angular momentum with inertial space causes the spin nuclei axes of the respective nuclei of the material being spun to tend to reorient parallel with the axis of the rotating member. This results in the nuclear polarization of the spin nuclei material. With sufficient polarization, an appreciable field of summed dipole movements emanates from the wheel rim flange surfaces to form a secondary dynamic interaction with the dipole moments of spin nuclei contained within the facing surface of a stationary body positioned immediately adjacent the rotating member.

When the stationary body, composed of suitable spin nuclei material, is connected in spatial series with the rotating member, a circuitous form of kinemassic field is created, the flux of which is primarily restricted to the field circuit.

If now means are provided to periodically reverse the direction of rotation of the wheel with respect to the facing surfaces of the stationary body positioned in immediate proximity thereto, then the resultant time-varying kinemassic field generates or induces an accompanying time-varying secondary gravitational field in the space immediately surrounding. That is to say, if the time-varying kinemassic field is made to undulate typically sinusoidally, there will be induced an accompanying undulating secondary gravitational field, which is phase-related to the kinemassic field. In this respect the induced secondary gravitational field is generated in a manner analogous to electromagnetic induction theory.

By properly configuring the undulating kinemassic field, the resultant secondary gravitational field may be essentially restrained to or confined within an enclosed space. Although numerous geometric configurations may be proposed, the necessary conditions are established in the preferred embodiment of the present invention by enclosing the kinemassic field generating apparatus, including the rotational members and at least a portion of the stationary member thereof, within an enclosure, the material portions of which obey the rules concerning kinemassic permeability.

The kinemassic field when so configured, will shield the enclosed space both with respect to the secondary gravitational field induced therein and with respect to the ambient gravitational field caused by the earth and other cosmic bodies, existing externally of the shielded space. The undulating kinemassic field, which gives rise to the enclosed secondary undulating gravitational field, is effective in reducing the quantity of flux lines within the space surrounded by the undulating kinemassic field contributed by the ambient gravitational field, thus reducing the mutual force of gravitational attraction acting between this structure and the earth or other cosmic bodies dependent upon their relative contribution to the local gravitational flux density.

It is well known that nature opposes heterogenous field flux densities. If the normal local flux density contributed by the earth and the other cosmic bodies within the space occupied by and surrounded by the undulating kinemassic field permeable structure were added to by the forcibly enclosed flux of the induced secondary undulating gravitational field, this enclosed flux density

would be in opposition to nature. Although the induced secondary undulating gravitational field would cause an undulating variation of the cosmic or primary gravitational field flux lines of force to penetrate within the kinemassic field permeable structure, if this undulation were sinusoidal, for example, the RMS or 0.707 value of peak reduction in mutual gravitational attraction would apply.

Means for increasing the relative magnitude of the undulating kinemassic field is effected by positioning a mass circuit within the induced secondary field space. The mass circuit in linking with the undulating kinemassic field circuit results in an increase in the kinemassic field and in the same sense effectively intensifies the primary gravitational field shielding. A partial parallel can be found in electromagnetic field theory, where it is known that a shorted secondary turn enhances iron saturation.

The mass circuit located in the induced secondary field space need not be comprised of material having a spin nuclei characteristic; rather, it is more important that this mass circuit have high mass density. A further desirable characteristic if this mass circuit is that it have a capability for mass flow with respect to the undulating kinemassic field structure. Mercury has the desired combination of properties and while other materials may be used, mercury is the most effective thus far known.

As indicated above, the effective result of generating a secondary undulating gravitational field within the space enclosed by the undulating kinemassic field is a relative reduction in apparent weight of the kinemassic field permeable structure, with respect to its apparent weight without such an undulating kinemassic field. The explanation of this phenomenon may be readily conceived as caused by the generation of a field force vector anti-parallel in direction to the local gravitational field force vector. If the shielding is sufficiently effective to reduce the density of gravitational field flux lines within the shielded space to the equivalent of the ambient flux lone density, there will be no net local distortion of the gravitational field flux line pattern in the space enclosed by the kinemassic field configuration. Without distortion of the local flux line pattern the two bodies cease to mutually attract and, in effect, become weightless, one with respect to the other.

Although similar in result, the technique for effecting the state of weightlessness in the present invention differs from conventional apparatus for achieving such a state of weightlessness. The latter, in general, utilize the force of radial acceleration to effectively "balance" the gravitational forces acting on a body.

The relative magnitude of the undulating kinemassic force field and the kinemassic permeability characterizing the associated structure are both influential in determining the effective shielding of the kinemassic field permeable structure. If the shielding is sufficiently effective so as to reduce the primary gravitational field flux line density within the enclosed space to less than that of the ambient, the distortion of the local gravitational field flux line pattern of reduced flux density would result in the anti-parallel field force vector magnitudes exceeding that force of the kinemassic field body's initial weight, i.e., the effective weight of the kinemassic field permeable structure absent the generated undulating kinemassic field. This condition would effectively endow the kinemassic field structure with a negative weight characteristic. As a consequence, the two bodies, that is the kinemassic field body and the earth or other cosmic body, would experience relative motion separating one another along the local primary gravitational field flux lines unless acted upon by other forces.

The hardware required to generate and sustain such an undulating kinemassic field is in part comprised of components which continue to retain a "non-field-energized" weight during the

period of field generation. Therefore, the ambient gravitational field flux line pattern within the structure will simultaneously experience zones of both reduced and increased densities. It is the average density of all the zones that determines the magnitude of the anti-parallel field force vector in its opposition to the ambient gravitational field force vector. Bodies located within the shielded space enclosed by the undulating kinemassic field will lose their weight with respect to the body earth in direct proportion to the reduction of ambient gravitational field flux lines which are common to it and the body earth.

As a consequence of the above, the shielding which results in a reduction of mutual attraction between bodies screened by the shielding effected by the undulating kinemassic force field does not violate the principle of equivalence. Thus, two free bodies of different masses, located within the shielded space, will fall within this space toward or away from the earth with equal accelerations. Also, the force of mutual gravitational attraction of two or more bodies located within the shielded space will be unaffected by the various degrees of shielding although their freefall acceleration toward one another will be affected.

From the foregoing discussion, it will be appreciated that both for the purpose of detecting the kinemassic field forces operative in the present invention, and for transforming such forces into energy for doing useful work, several basic apparatus elements are necessary. First apparatus is needed to enable masses to be placed in relative motion to one another; which relative motion may occur in two mutually orthogonal directions. In order to maximize field strength the apparatus should be capable of generating high velocities between the particles in relative motion. Furthermore, the apparatus should be configured so that the proximity of the particles which are in relative motion is maximized. The necessity of using relatively dense material comprising half integral spin nuclei for the field circuit portion of the apparatus has already been stressed. These and other features are discussed in greater detail below in explanation of the drawings depicting an implementation of the invention.

In considering the drawings, reference will first be made to the general arrangement of components shown in Figures 1 and 2. As viewed in Figure1, the equipment is mounted upon a stationary base comprising a horizontal structural element 11 which rests upon poured concrete pilings not shown or other suitable structurally rigid material. It should be made clear at the outset that the stationary base although not a critical element in its present form nevertheless serves an important function in the subject invention. Thus, the stationary base acts as a stabilized support member for mounting the equipment and, perhaps more significantly, the horizontal portion thereof is of such material that it tends to localize the kinemassic force field to the kinemassic force field generating apparatus proper. This latter feature is discussed in more detail below. The surface uniformity of the horizontal structural element 11 also facilitates the alignment of equipment components. In the reduction to practice embodiment of the present invention, a layer of shock-absorbing material, not shown, was interposed between the stationary base and the floor.

Shown mounted on the horizontal structural element 11 is the kinemassic force field generating apparatus indicated generally as 10, the lower portion of which is referred to as the lower mass member 12. The lower mass member 12 is not to be confusingly associated with the mass circuit mentioned above as being positioned in the space experiencing the secondary gravitational field. The nature and specific identity of the latter mentioned mass circuit will be more fully explained in connection with the explanation of Figure 7.

An upper mass member 13 is positioned in mirrored relationship with respect to member 12 and separated somewhat to provide two air gaps therebetween. The lower and upper mass members

12 and 13 function as field circuit members in relationship to a generator 14 and a detector 15 positioned with respective one's of two said gaps. The spatial relationship of the generator 14, the detector 15 and the mass members 12 and 13 is such as to form a kinemassic force field series circuit.

All of the material members of the field circuit are comprised of half integral spin material. For example, the major portion of the generator 14, the detector 15, as well as the upper and lower mass members 13 and 12 are formed of a particular brass alloy containing 89% copper of which both isotopes provide a three-halves proton spin, 10% zinc, and 1% lead as well as traces of tin and nickel. The zinc possesses one spin nuclei isotope which is 4.11% in abundance and likewise the lead also contains one spin nuclei isotope which is 22.6% in abundance. In order to gain an estimate of apparatus size, the upper mass member 13 has an overall length of 56 m and a mass of 43 kilograms.

It will be seen that, by far, the constituents of the mass members a re such as satisfy the criteria of half integral spin nuclei material for those apparatus parts associated with the field and the use of non-spin nuclei material for those parts where it is desired to inhibit the field. Accordingly, all support or structural members, such as the horizontal element 11 consist of steel. The iron and carbon nuclei of these structural members are classed as no-spin nuclei and thus represent high relative reluctance to the kinemassic field. Supports 1 are provided to accommodate the suspension of the upper mass member 13. The supports 16 are of steel the same as the horizontal support element 11. The high relative reluctance of steel to the kinemassic field minimizes the field flux loss created in the field series circuit of mass members 12 and 13, the generator 14 and the detector 15. The loss of field strength is further minimized by employing high-reluctance isolation ridges at the point of contact between the lower and upper mass members 12 and 13, and the structural support members 11 and 16.

Shunt losses within the apparatus were, in general, minimized by employing the technique of minimum mass contact; the use of low field permeability material at the isolation bridges or structural connections; and avoiding bulk mass proximity.

A number of techniques were developed for optimizing the isolation bridge units including Carboloy cones and spherical spacers. As is depicted more clearly in Figures 3,4,and 5, the structural connection unit ultimately utilized consisted of a hardened 60° steel cone mounted within a setscrew and bearing against a hardened steel platen. The contact diameter of the cone against the platen measured approximately 0.007 inch and was loaded within elastic limits. Adjustment is made by means of turning the setscrew within a mated, threaded hole.

Figure 2 is presented in rather diagrammatic form; however, the diagrammatic configuration emphasizes that it consists of a rotatable member corresponding to the generator 14 of Figure 1 which is "sandwiched" between a pair of generally U-shaped members corresponding to the lower and upper mass members 12 and 13 of Figure 1. The wheel of the generator 14 is mounted for rotation about an axis in the plane of the drawing. The generator assembly is also shown as being mounted for rotation about an axis perpendicular to the plane of the drawing; however, the generator assembly may alternatively be oriented to rotate in the plane of the drawing. When member 14 is rotated rapidly with respect to the U-shaped member 12 and 13, a kinemassic field is generated which is normal to the plane defined by the rotating member and within the plane of the drawing. As such, it may be represented in the drawing of Figure 2 as taking a generally counter-clockwise direction with respect to the field series circuit members.

Referring once more to Figure 1, it is seen that support for the generator unit 14 is provided by way of a support assembly 17, also fabricated of steel components. The support assembly 17 is in turn clamped to the horizontal structural element 11 by way of bracket assemblies 18.

The detector 15 is of similar configuration to the generator assembly 14, the exception being that the detector assembly is mounted for limited rotation about the axis normal to the plane of the paper. The limited rotational capability is effected by a knife-edge mounting 19 more clearly discernable in Figures 3A and 3B. As will become more readily apparent from the discussion of the operation of the embodiment of Figure 1 which follows, the knife-edge mounting enables a slow sinusoidal oscillation of the detector assembly about its knife-edge axis.

A pair of light-emitting and light-sensing elements 20a and 20b respectively are shown in Figure 1 in operative relationship to the generator and detector assemblies 14 and 15. The function of the light-generating and light-sensing members 20a and 20b is to measure the rate of spin of the generator and detector wheels respectively. For this purpose every other quadrant on the rim surface is painted black. Accordingly, light directed at the rim of the wheel will be reflected by the unpainted surfaces into light-sensing cells associated with a rate-sensing circuit of conventional design. Since the rate-measuring circuit forms no part of the present invention it has not been depicted in the actual drawing nor is it the subject of further explanation.

Compressed air or nitrogen is used to drive the generator and detector wheels. In this respect the compressed gas is directed against turbine buckets 21b cut in the rim of wheel 21 of both the generator and detector assemblies and such buckets are more readily discernible in Figures 3, 4, and 5.the compressed gas is supplied to the generator and detector assemblies by way of air supply lines 28a and 28b.

Figures 3, 4 and 5 present details of the generator and detector assemblies of Figures 1 and 2. In particular, these figures disclose the relationship between a freely rotatable wheel 21, a bearing frame 22m and a pair of pole pieces 23. The bearing frame 22 is of structural steel, and functions to spatially orient the three generator parts without shunting the generated field potential as well as to maintain this orientation against the force moment stresses of precession.

Positioning of the generator wheel 21 with respect to the cooperative faces of the pole pieces 23 is effected by way of the bearing frame upon which the generator wheel is mounted. In this respect the high-reluctance isolation bridges mentioned with respect to Figures 1 and 2 are herein shown as set screws 24 which are adjustably positioned to cooperate with hardened steel platens 25. The set screws 24 are mounted on the pole pieces 23 and are adjustably positioned with respect to steel platens 25 cemented to the bearing frame 22 with respect to the interface surfaces 23a of the pole pieces 23.

In the implementation of the present invention the air gap formed between the generator wheel rim flanges and the stationary pole pieces 23 was adjusted to a light-rub relationship when the wheel was slowly rotated; as such this separation was calculated to be 0.001 centimeter for a wheel spin rate of 28,000 rpm due to the resulting hoop tension. In the drawing of Figure 3 the spacing between the pole pieces 23 and the generator wheel rim flange has been greatly exaggerated to indicate that in fact such a spacing does exist.

The generator wheel 21 utilized in the implementation of the present invention has an 8.6 cm diameter and an axial rim dimension of 1.88cm. The rim flange surfaces 21a which are those field emanating areas closely adjacent the surfaces 23a of the pole pieces 23, are each 29.6 square cm. The rim portion of the wheel has a volume of 55.7 cubic cm neglecting the rim turbine slots 21b.

The generator wheel 21 and an associated mounting shaft 26 are mounted of the bearing frame 22 by means of enclosed double sets of matched high speed bearings 27.

Shaft members 30 carry suitable bearing members 31 for rotatably mounting the generator assembly with respect to a second axis. The support assembly 17 of Figure 1 is partially represented in Figure 3, and as noted above provides the mounting means for positioning the generator assembly 14 with respect to the lower and upper mass members 12 and 13.

Reference is now made to Figures 3A and 3B which disclose a portion of the detector 15 of Figure 1 including the knife-edge mounting 19 of Figure 1. Adjusting means 32 are shown connected to the bearing frame 22a of the detector assembly 15 by means of a disc-like member 33. Attached to the lower portion of the disc 33, and depicted in the end view of the detector assembly of Figure 3B, is shown a second adjusting member 34, which in combination with equivalent members 32 and 34 mounted on the other end of the detector assembly, provide means for symmetrically aligning the detector assembly within the gap provided by the lower and upper mass members 12 and 13. This further means that the knife-edge assembly is mounted so that the knife-edge axis is coincident with the geometric axis of the detector assembly. At the same time, the center of mass of the detector assembly is located below the geometric center of the detector assembly thereby providing a righting moment to the assembly due to the asymmetry of the mass center with respect to the knife-edge axis. The adjusting means 32 is shown as bearing against the support assembly 17, thereby, in combination with the knife-edge mounting at either end of the detector assembly, providing an effective four point suspension for symmetrically positioning the detector assembly 15 within the end poles of the upper and lower mass members.

In Figures 1, 2 and 3 the detector assembly 15 is shown in three different positions. As will become apparent from the discussion of the operation of the subject system which follows, the facility to so reposition the detector assembly is necessary to demonstrate its operative capabilities. Accordingly, the bearing frame 22a is rotatably mounted with respect to the disc 33 by means of a bearing surface interfacing the frame 22a with the shaft 35, the latter being affixed to the face of the disc 33.

Proceeding now to the explanation of the operation of the embodiment of the invention thus far disclosed, it will be appreciated that in accordance with the theory of operation of the present apparatus when the generator wheel is made to spin at rates upwards of 10 to 20 thousand rpm, effective polarization of spin nuclei within the wheel structure gradually occurs. This polarization gradually gives rise to domain-like structures which continue to grow so as to extend their field dipole moment across the interface separating the rim 21 from the pole pieces 23. Secondary dynamic interaction of gravitational coupling increases the field flux lines around the kinemassic force generating assembly, thus resulting in ever increasing total nuclear polarization of half integral spin nuclei.

The non-electromagnetic forces so generated within the subject apparatus are primarily channeled through the high-kinemassic permeability material defining the series field circuit of the apparatus. The fact that the high speed rotatable wheels of both the generator and detector assemblies are capable of being positioned in a series aiding or series opposing relationship, facilitates the determination of the effective influence of the energies generated in one on the other.

The detector, when carefully balanced on its knife-edges as shown in Figures 3A and 3B, exhibits an oscillation period of 11 seconds. When the wheels are energized a stiffening action is induced due to the reaction of the compressed gas impingement against the wheel bucket 21b,

since the jet nozzle is fixed with respect to the apparatus base. This results in a reduction of the oscillation period to approximately 6 seconds. A light image not shown is directed against the mirrored face of the knife-edge 19 and reflected onto a calibrated wall screen. Measurements were taken with the apparatus so operative, which measurements established the oscillatory extremes of the reflected light beam for a pole-aligned relationship of the spinning generator and detector wheels. The results of one such set of measurements are recorded in Figure 6. Therein, the x's and dots represent extremes in deviation while the large circles represent the mean thereof. The mean was in turn used to establish a null line to be compared with a similar null line derived from pole-opposed orientation of the generator and detector wheels. As a result, a displacement from equilibrium of approximately 13 arc minutes is shown.

In order to minimize the shift of the null line, the field circuit polar relationship of the generator and detector poles was reversed every30 or 40 minutes from a relation of poles aligned, to poles opposed, to poles aligned. An average null shift of 26 arc minutes is indicated in Figure 6. That the interaction between generator and detector was in fact accountable for the recorded results was demonstrably supported when the upper mass member was raised so as to create two air gaps one cm in length respectively. Predictably, the disruption to the field circuit continuity resulted in the failure of the apparatus to register a shift in the null lines upon reversal of the poles.

Reference is now made to Figure 7 which discloses an apparatus constructed in accordance with the principles of the present invention for generating a time-variant secondary gravitational field. This apparatus is a mere modification of the apparatus in Figures 1 and 2 wherein one detector assembly 15 has been removed and supplementary means are provided to mechanically implement the rotation of the generator assembly 14 about the axis perpendicular to the pane of the paper. These supplementary means are in the nature of an auxiliary motor 36 having a drive pulley 38 adapted to spin the generator assembly 14 about an axis normal to the plane of the drawing and coincident with that of the shaft 30. The shaft 30 carries a pulley 40 which is driven by the motor and pulley assembly 36-38 by way of a conventional drive belt 42. The wheel 21 of the generator assembly 14 is driven in the manner outlined above, namely by means of a source of compressed air not shown.

The supporting assembly depicted in Figure 7 in partially sectioned form as member 44, is in reality the equivalent of the series mass circuit of Figures 1 and 2, inverted or turned inside out so s to form a shield for the kinetic field generating apparatus. Included as part of the supporting assembly is member 44A which is provided to position the generator assembly 14 in the discontinuity formed in the mass circuit. The kinemassic field generated within the apparatus of Figure 7 upon energization of the wheel 21 is directed in an enveloping fashion about its generator, being confined in general to the shell. The cross sectional thickness of the shell along equipotential lines must be equal in order to ensure a homogenous field within the structure. If now the spin rate of the wheel 21 is made to vary, or if the generator assembly 14 is made to rotate about the axis defined by the shaft 30, a time-variant secondary gravitational field is induced in the toroidal space 46.

The secondary gravitational field undulates in a sinusoidal manner with the undulating kinemassic field confined to the series mass circuit. Since the kinemassic field in the dense mass circuit 44 has been restricted through permeability, into an enveloping shell about the generator 14, it follows that the induced undulating secondary gravitational field is likewise restricted to the enclosure 46 as the flux lines of both fields must interlink. In accordance with the analogous electromagnetic field theory, the kinemassic field flux lines and the secondary gravitational field

flux lines interlink in such manner that, as the kinemassic field alternates, these interlinking loops decay and build up in alternate vector directions in proper phase relation.

A hollow ring member 48 is positioned within the toroidal space 46 and supported thereby a series of fine steel wire spokes 50 secured to the ring and the outer portion of the inverted core housing 44 preferably along points of equipotential of the kinemassic field. Within the hollow ring 48 is contained a dense fluid such as mercury depicted in Figure 7 generally as member52. Alternatively, the ring-fluid combination may take the form of a single solid mass. In the latter event the mass circuit would be supported on bearings facilitating its rotation about an axis common to the axis of the generator 21 in order to permit mass flow or rotation of the mass circuit under the influence of the alternating secondary gravitational field. The shielding effected by the design considerations of the toroidal shell 44 with respect to the primary gravitational field reduces the inertial parameter of mass acceleration within the toroidal space 46 in proportion to the ambient gravitational shielding effect. With reduced inertia there will be an appreciable rotational flow displacement of the mass circuit 48-52 fore ach half cycle of the induced secondary gravitational field, thereby further strengthening the coupling effected between the effective field forces, i.e., the primary gravitational field, the kinemassic field and the secondary gravitational field.

Consider now that the apparatus of Figure 7 is energized such that the wheel 21 spins about its axis creating a uniformly distributed kinemassic field throughout the entire field circuit referred to generally as that encompassed within the inverted core housing 44. As the generator assembly 14 is energized to rotate about the axis passing through shaft 30, a uniformly distributed alternating kinemassic field is established throughout the field circuit.

The presence of the undulating kinemassic field produces a shielding effect within the inverted housing effectively restricting the induced secondary gravitational field while at the same time tending to shield or force out the flux due to the ambient gravitational field. As the spin rates of the wheel and the generator assembly about their respective axes are increased, there results a stronger undulating kinemassic force field of higher frequency. The spin rates may be so varied that a mean gravitational flux line density within the apparatus of Figure 7 exists which is equivalent to the primary gravitational flux line density, i.e., that due to the earth and other cosmic bodies. This condition establishes a state of weightlessness or zero gravitational force of attraction with respect to other masses such as earth. For that particular value of gravitational field gradient.

If the spin rates of the wheel and the generator assembly are further increased there results a "bowing-out" or spreading of the gravitational flux lines within the immediate proximity of the apparatus of Figure 7 so as to result in a lesser flux line density, thus resulting in the propulsion of the apparatus along the local gravitational field lines of force in a direction diametrically opposed to the local gravitational field force vector.

Because of the nature of the interaction of the primary gravitational field, the secondary gravitational field forces will continue to act upon the apparatus as it passes into lesser gravitational field gradients; however, it will do so with diminishing magnitudes until the local gravitational flux line density about the apparatus of Figure 7 is no longer effectively diminished thereby. The energy required to propel a vehicle powered by an engine, such as is described above, is accounted for by the way of the gravitational filed potential energy gained by such a vehicle as it passes to areas of lesser gravitational field intensities. Energy input into this engine would appear as the product of torque and rotational values about the spin axes of both the wheel

and the generator assembly, and especially about the latter axis which is responsible for alternating the kinemassic field and thereby generating the secondary gravitational component.

As was mentioned above in explanation of the embodiment of Figures 1 and 2, the wheel 21 and the generator assembly 14 are mounted so as to be rotatable in mutually orthogonal directions. It was further mentioned that such orthogonal rotation is not an absolute necessity, it being only necessary that relative motion be established between the wheel 21 and the stationary pole pieces 23. The generator assembly is made to rotate thereby effecting an undulation in the kinemassic field flux in the associated mass circuit. Figure 7A and 7B disclose a variation of the apparatus of Figure 7 which satisfies the basic requirements outlined above while at the same time providing certain advantages not available in the aforementioned structure.

In this respect Figures 7A and 7B disclose an embodiment wherein the spin axis of the equivalent wheel structure 21 and the generator assembly 14 are concentric thereby eliminating precessional forces present in the embodiment of Figure 7 due to the rotation of the respective members about the two mutually orthogonal axes. The absence of precessional forces permits a close tolerance to be established between the cooperating faces of the wheel structure 21, the pole pieces 23 and the mass circuit 44.

The embodiment of Figures 7A and 7B is also to be preferred to that of Figure 7 in that the design of the generator assembly of the former permits the energization of the independently rotatable members 21 and 23 by means of a single motor 36 differentially geared so as to effect the rotation of the wheel 21 at a speed in excess of that of the generator assembly, and as indicated, in a reverse direction thereto.

Also indicated in the embodiment of Figures 7A and 7B is the orientation of the flux within the mass circuit, the latter being constructed preferably of bismuth. It should be understood that the direction of flux within the mass circuit reverses with each reversal in orientation of the equivalent pole pieces 23 due to the rotation of the generator assembly 14.

It will be apparent from the foregoing description that there has been provided an apparatus for generating time-variant kinemassic forces due to the dynamic interaction of relatively moving bodies. Although in its disclosed application the time-variant kinemassic force has been described in relation to its function in generating a secondary gravitational force, it should be readily apparent that other equally basic applications of these forces are contemplated.

Thus, in addition to providing an effective propulsion technique, the principles of the present invention may be utilized for the purpose of generating localized areas of gravitational shielding for housing medical patients for which such weight reductions would be beneficial. In addition, the principles may be adapted to laboratory use, as for example the analysis of the effects of a sustained reduction of "g" value upon astronauts and for specialized manufacturing techniques.

While in accordance with the provisions of the statutes there has been illustrated and described the best form of the invention known, it will be apparent to those skilled in the art that changes may be made in the apparatus described without departing from the spirit of the invention as set forth in the appended claims, and that in some cases, certain features of the invention may be used to advantage without corresponding use of other features.

Having now described the invention, what is claimed as new and for which it is desired to secure Letters Patent is:

(1) An apparatus for establishing a time-variant kinemassic force field resulting for the relative motion of moving bodies, comprising a generator assembly independent portions of which are mounted to assume relative rotational motion about at least a single axis locate within said

generator assembly, a mass circuit of dense material of discontinuous configuration, means for positioning said generator assembly within said mass circuit discontinuity, and means for initiating independent relative motion of said generator assembly portions whereby an undulating kinemassic force field is established within said mass circuit.

(2) Apparatus according to claim 1 further characterized in that said mass circuit and said relatively moving portions are comprised of spin nuclei material.

(3) An apparatus according to claim 1 wherein said mass circuit is further characterized by first and second U-shaped members positioned in mirrored relationship with respect to each other and displaced somewhat so as to form two air gaps therebetween, one of said gaps corresponding to said mass circuit discontinuity and being adapted to receive said generator assembly and the other gap being adapted to receive a detector assembly.

(4) Apparatus constructed in accordance with claim 1 wherein said mass circuit is further characterized by a shell of generally toroidal configuration having a cylindrical central portion within which is located said mass circuit discontinuity.

(5) An apparatus constructed in accordance with claim 2 wherein said generator assembly mounted within said mass circuit discontinuity further comprises a rotatable member, a frame, means for mounting said rotatable member on said frame, pole pieces mounted on said frame on either side of said rotatable member, each pole piece presenting a generally circular face in close proximity to but spaced from a face of said rotatable member about a first axis, and means for rotating said frame about a second axis oriented perpendicular to said first axis.

(6) Apparatus constructed in accordance with claim 4 and further characterized by a dense mass ring mounted within the walls of said shell structure by mounting mass establishing small area contact between said mass ring and said shell structure.

(7) An apparatus constructed in accordance with claim 6 wherein said dense mass ring is further comprised of a hollow shell housing a liquid metal of suitable density.

(8) Apparatus according to claim 6 wherein said shell is further characterized as being of equal cross sectional area normal to the kinemassic lines of force.

(9) Apparatus constructed according to claim 3 wherein said shell is further characterized as being of equal cross sectional area normal to the kinemassic lines of force.

(10) A method of generating a time-variant kinemassic force field including the steps of:

juxtaposing in field series relationship a first member comprised of spin nuclei material similarly constituted, portions of said member being adapted to assume relative rotational motion about at least a single axis;

initiating the independent rotation of said first member about at least a single axis whereby an undulating kinemassic force field is established therein;

and so configuring said second member as to confine said undulating kinemassic force field thereto whereby a time-variant secondary gravitational force field is induced in the surrounding space.

US Patent # 3,626,606

Method & Apparatus for Generating a Dynamic Force Field

Henry W. Wallace

December 14, 1971
US Cl. 35-19

Abstract -- Apparatus and method for generating a non-electromagnetic force field due to the dynamic interaction of relatively moving bodies through gravitational coupling, and for transforming such force fields into energy for doing useful work.

Description

The method of generating such non-electromagnetic forces includes the steps of juxtaposing in field series relationship a stationary member, comprising spin nuclei material further characterized by a half integral spin value, and a member capable of assuming relative motion with respect to said stationary member and also characterized by spin nuclei material of one-half integral spin value; and initiating the relative motion of said one member with respect to the other whereby the interaction of the angular momentum property of spin nuclei with inertial space effects the polarization of the spin nuclei thereof, resulting in turn in a net component of angular momentum which exhibits itself in the form of a dipole moment capable of dynamically interacting with the spin nuclei material of the stationary member, thereby polarizing the spin nuclei material in said stationary member and resulting in a usable non-electromagnetic force.

This invention relates to an apparatus and method for use in generating energy arising through the relative motion of moving bodies and for transforming such generated energy into useful work. In the practice of the present invention it has been found that when bodies composed of certain material are paced in relative motion with respect to one another there is generated an energy field therein not heretofore observed. This field is not electromagnetic in nature; being by theoretical prediction related to the gravitational coupling of moving bodies.

The initial evidence indicates that this non-electromagnetic field is generated as a result of the relative motion of bodies constituted of elements whose nuclei are characterized by half integral "spin" values; the spin of the nuclei being synonymous with the angular momentum of the nucleons thereof. The nucleons in turn comprise the elemental particles of the nucleus; i.e., the neutrons and protons. For purposes of the present invention, the field generated by the relative motion of materials characterized by a half integral spin value is referred to as a "kinemassic" force field.

It will be appreciated that relative motion occurs on various levels; i.e., there may be relative motion of discrete bodies as well as of the constituents thereof including on a subatomic level, the nucleons of the nucleus. The kinemassic force field under consideration is a result of such relative motion, being a function of the dynamic interaction of two relatively moving bodies including the elemental particles thereof. The value of the kinemassic force field, created by reason of the dynamic interaction of the bodies experiencing relative motion, is the algebraic sum of the fields created by reason of the dynamic interaction of both elementary particles and of the discrete bodies.

For a closed system comprising only a stationary body, the kinemassic force, due to the dynamic interaction of the particles therein, is zero because of the random distribution of spin orientations of the respective particles. Polarization of the spin components so as to align a majority thereof in a preferred direction establishes a field gradient normal to the spin axis of the elementary particles. The present invention is concerned with an apparatus for establishing such a preferred orientation and as a result generating a net force component capable of being represented in various useful forms.

Accordingly, the primary object of the present invention concerns the provision of means for generating a kinemassic field due to the dynamic interaction of relatively moving bodies.

A further object of the present invention concerns a force field generating apparatus wherein means are provided for polarizing material portions of the apparatus so as to reorient the spin of the elementary nuclear components thereof in a preferred direction thereby generating a detectable force field.

The kinemassic force field finds theoretical support in the laws of physics, being substantiated by the generalized theory of relativity. According to the general theory of relativity there exists not only a static gravitational field but also a dynamic component thereof due to the gravitational coupling of relatively moving bodies. This theory proposes that two spinning bodies will exert force on each other. Heretofore the theoretical predictions have never been experimentally substantiated; however, as early as 1896, experiments were conducted in an effort to detect predicted centrifugal forces on stationary bodies place near large, rapidly rotating masses. The results of these early experiments were inconclusive, and little else in the nature of this type of work is known to have been conducted.

It is therefore another object of the present invention to set forth an operative technique for generating a measurable force field due to gravitational coupling of relatively moving bodies.

Another more specific object of the present invention concerns a method of generating a non-electromagnetic force field due to the dynamic interaction of relatively moving bodies and for utilizing such forces for temperature control purposes including the specific application of such forces to the control of lattice vibrations within a crystalline structure, thereby establishing an appreciable temperature reduction, these principles being useful for example in the design of a heat pump.

The foregoing objects and features of novelty which characterize the present invention as well as other objects of the invention are pointed out with particularity in the claims annexed to and forming part of the present specification. For a better understanding of the invention, and its advantages and specific objects allied with its use, reference should be made to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

Figure 1 is an overall perspective view of equipment constructed according to the present invention, this equipment being designed especially for demonstrating the useful applications of kinemassic force fields;
[Click to enlarge]

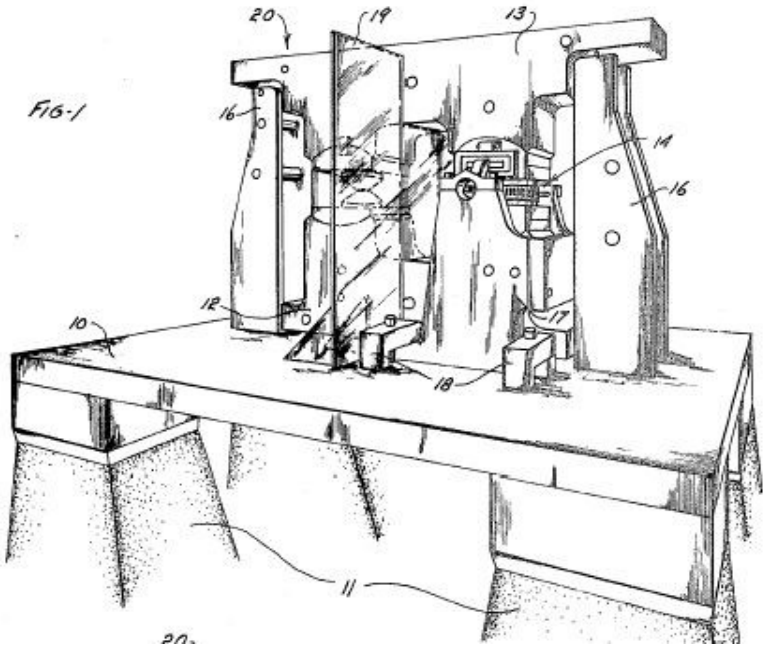
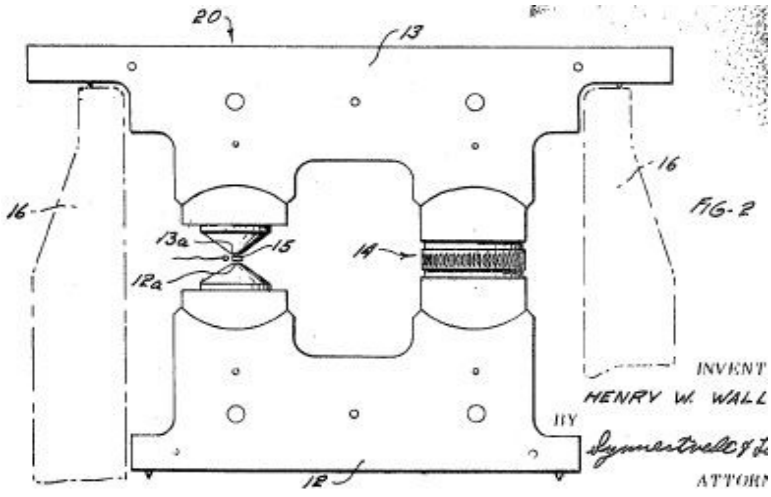
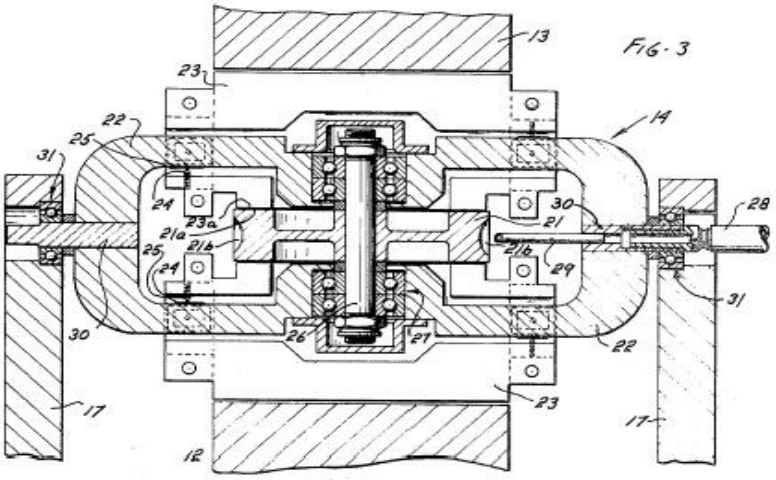
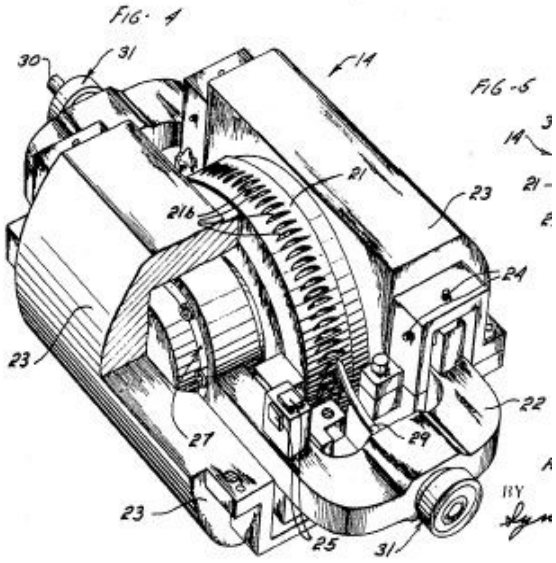


Figure 2 is an isolation schematic if apparatus comprising the kinemassic field circuit of the apparatus of Figure 1, showing the field series relationships of the generator and detector units;
[Click to enlarge]



Figures 3, 4, and 5 show the generator of Figures 1 and 2 in greater detail;
[Click to enlarge]





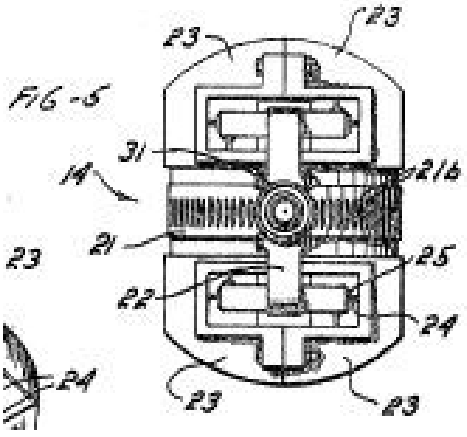


Figure 6 is an enlarged view of the detector working air gap area of the apparatus in Figures 1 and 2;
[Click to enlarge]

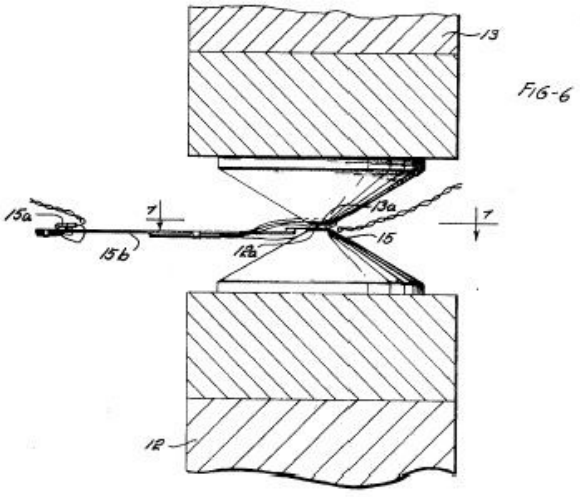


FIG-6

Figure 7 is a sectional view of Figure 6 showing associated control and monitoring equipment; and
[Click to enlarge]

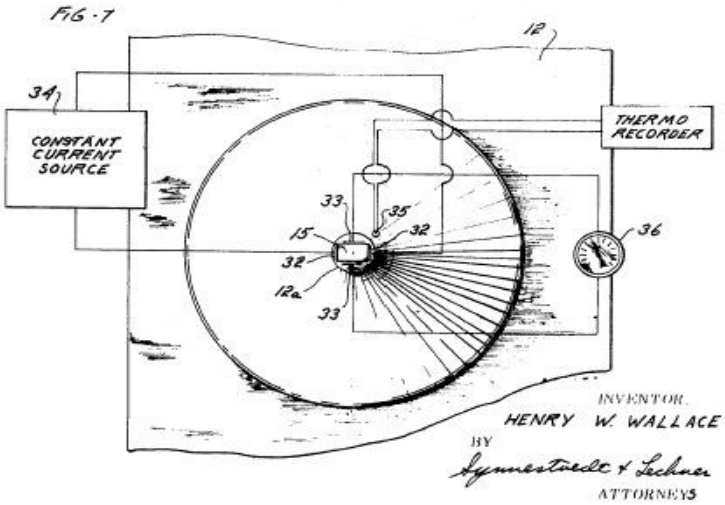


Figure 8 represents measured changes in the operating characteristics of a crystalline target subject to a kinemassic force field generated in the apparatus of Figures 1 and 2.
[Click to enlarge]

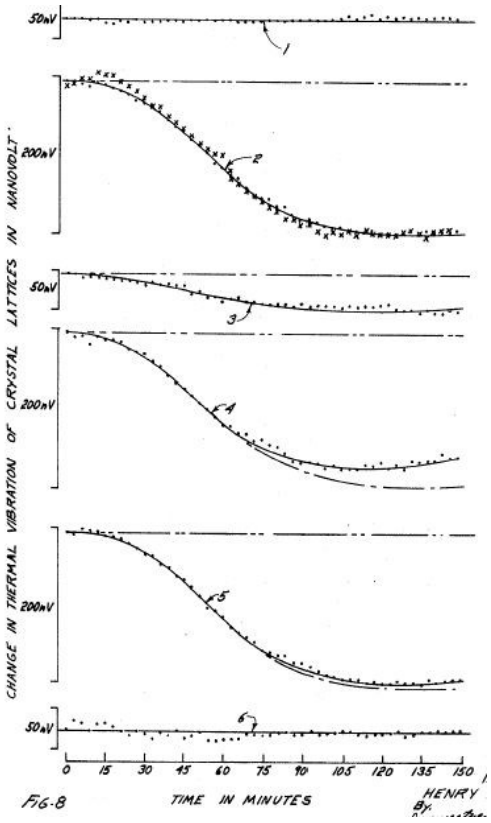


FIG-8

Before getting into a detailed discussion of the apparatus and steps involved in the practice of the present invention it should be helpful to an understanding of the present invention if consideration is first given to certain defining characteristics, many of which bear an analogous relationship to electromagnetic field theory. A first feature is that the kinemassic field is vectorial in nature. The direction of the field vector is a function of the geometry in which the relative motion between mass particles takes place.

The second significant property of the kinemassic field relates the field strength to the nature of the material in the field. This property may be thought of as the kinemassic permeability by analogy to the concept of permeability in magnetic field theory. The field strength is apparently a function of the density of the spin nuclei material comprising the field circuit members. Whereas the permeability in magnetic field theory is a function of the density of spin nuclei and the measure of magnitude of their half integral spin values. As a consequence of this latter property, the field may be directed and confined by interposing into it denser portions of desired configuration. For example, the field may be in large measure confined to a closed loop of dense material starting and terminating adjacent a system wherein relative motion between masses is occurring.

A further property of the kinemassic force field relates field strength to the relative spacing between two masses in relative motion with respect to one another. Thus, the strength of the resultant field is a function of the proximity of the relatively moving bodies such that relative motion occurring between two masses which are closely adjacent will result in the generation of a field stronger than that created when the same two relatively moving bodies are spaced farther apart.

As mentioned above, a material consideration in generating the kinemassic force field concerns the use of spin nuclei material. By spin nuclei material is meant materials in nature which exhibit a nuclear external angular momentum component. This includes both the intrinsic spin of the unpaired nucleon as well as that due to the orbital motion of these nucleons.

Since the dynamic interaction field arising through gravitational coupling is a function of both the mass and the proximity of two relatively moving bodies, then the resultant force field is predictably maximized within the nucleus of an atom due to the relatively high densities of the nucleons, both in terms of mass and relative spacing, plus the fact that the nucleons possess both intrinsic and orbital components of angular momentum. Such force fields may in fact account for a significant portion of the nuclear binding force found in all nature.

It has been found that for certain materials, namely those characterized in a half integral spin value, the external component of angular momentum thereof will be accompanied by a force due to the dynamic interaction of the nucleons. This is the so-called kinemassic force which on a submacroscopic basis exhibits itself as a field dipole moment aligned with the external angular momentum vector. These moments are of sufficient magnitude that they interact with adjacent, or near adjacent spin nuclei field dipole moments of neighboring atoms.

This latter feature gives rise to a further analogy to electromagnetic field theory in that the interaction of adjacent spin nuclei field dipole moments gives rise to nuclear domain-like structures within matter containing sufficient spin nuclei material.

Although certain analogies exist between the kinemassic force field and electromagnetic field theory, it should be remembered that the kinemassic force is essentially non-responsive to or affected by electromagnetic force phenomena. This latte condition further substantiates the ability of the kinemassic field to penetrate through and extend outward beyond the ambient electromagnetic field established by the moving electrons in the atomic structure surrounding the respective spin nuclei

As in electromagnetic field theory, in an unpolarized sample, the external components of angular momentum of the nuclei to be subjected to a kinemassic force field are originally randomly oriented such that the material exhibits no residual kinemassic field of its own. However, establishing the necessary criteria for such a force field effects a polarization of the spin components of adjacent nuclei in a preferred direction thereby resulting in a force field which may be represented in terms of kinemassic field flux lines to the direction of spin.

The fact that spin nuclei material exhibits external kinemassic forces suggests that these forces should exhibit themselves on a macroscopic basis and thus be detectable, when arranged in a manner similar to that for demonstrating the Barnet effect when dealing with electromagnetic phenomena.

In the Barnett effect a long iron cylinder, when rotated at high speed about its longitudinal axis, was found to develop a measurable component of magnetization, the value of which was found to be proportional to the angular speed. The effect was attributed to the influence of the impressed rotation upon the revolving electronic systems due to the mass property of the unpaired electrons within the atoms.

In the apparatus constructed in accordance with the foregoing principles it was found that a rotating member composed of spin nuclei material exhibits a kinemassic force field. The interaction of the spin nuclei angular momentum with inertial space causes the spin nuclei axes of the respective nuclei of the material being spun to tend to reorient parallel with the axis of the rotating member. This results in the nuclear polarization of the spin nuclei material. With

sufficient polarization, an appreciable field of summed dipole moments emanates from the wheel rim flange surfaces to form a secondary dynamic interaction with the dipole moments of spin nuclei contained within the facing surface of a stationary body positioned immediately adjacent the rotating member.

When the stationary body, composed of suitable spin nuclei material, is connected in spatial series with the rotating member, a circuitous form of kinemassic field is created; the flux of which is primarily restricted to the field circuit.

Having now further defined the substantiating theory giving rise to the kinemassic forces operative in the present invention, reference is now made to the aforementioned drawings depicting in general an apparatus embodying the defining characteristics outlined above.

From the foregoing discussion, it will be appreciated that for both the purpose of detecting and exploiting the kinemassic field, several basic apparatus elements are necessary. First, apparatus is needed to enable masses to be placed in relative motion to one another. In order to maximize field strength the apparatus should be capable of generating high velocities between the particles in relative motion. Furthermore, the apparatus should be configured so that the proximity of the particles which are in relative motion is maximized. The necessity of using relatively dense material comprising half integral spin nuclei for the field circuit has already been stressed. These and other features are discussed in greater detail below in explanation of the drawings depicting an implementation of the invention, primarily for detection of the kinemassic field.

In considering the drawings, reference will first be made to the general arrangement of components, as particularly shown in Figures 1 and 2. As viewed in Figure 1, the equipment is mounted upon a stationary base comprising a horizontal structure element 10 which rests upon permanent pilings of poured concrete 11 or other suitable structurally rigid material. It should be made clear at the outset that the stationary base although not a critical element in its present form nevertheless serves an important function in the subject invention. Thus, the stationary base acts as a stabilized support member for mounting the equipment, and perhaps more significantly, the horizontal portion thereof is of such material that it tends to localize the kinemassic force field to the kinemassic force field generating apparatus proper. This latter feature is discussed in more detail below. The surface feature is discussed in more detail below. The surface uniformity of the horizontal structure element 10 also facilitates the alignment of equipment components. In the reduction to practice embodiment of the present invention a layer of shock-absorbing material (not shown) was interposed beneath the stationary base and the floor.

Shown mounted on the horizontal structural element 10 is the kinemassic force field generating apparatus indicated generally as 20, the lower portion of which is referred to as the lower mass member 12. An upper mass member 13 is positioned in mirrored relationship with respect to member 12 and separated somewhat to provide two air gaps therebetween. The lower and upper mass members 12 and 13, respectively, are formed of a particular brass alloy containing 89% copper, of which both isotopes provide a three-halves proton spin, 10% zinc, and 1% lead, as well as traces of tin and nickel. The zinc atom possesses one spin nuclei isotope which is 4.11% in abundance and likewise the lead also contain one spin nuclei isotope which is 22.6% in abundance. In order to gain an estimate of apparatus size, the upper circuit member has an overall length of 56 centimeters and a mass of 43 kilograms.

It will be seen that the constituents of the mass members are such as satisfy the criteria of half integral spin nuclei material for those apparatus parts associated with the fields and the use of non-spin material for those parts where it is desired to inhibit the field. Accordingly, all support or structural members, such as the horizontal structural element 10, consist of steel. The iron and

carbon nuclei of these structural members are classed as no-spin nuclei and thus represent high relative reluctance to the kinemassic field. Supports 16 are provided to accommodate the suspension of the supper mass member 13. The supports 16 are of steel the same as the horizontal support element 10. The high relative reluctance of steel to the kinemassic field minimizes the field flux loss created in the field series circuit of mass members 12 and 13, the generator 14, and the detector 15. The loss of field strength is further minimized by employing high-reluctance isolation bridges at the points of contact between the lower and upper mass members 12 and 13, and the structural support members 10 and 16.

Shunt losses within the apparatus were, in general, minimized by employing the technique of minimum mass contact; the use of low field permeability material at the isolation bridges or structural connections; and avoiding bulk mass proximity.

A number of techniques were developed for optimizing the isolation bridge units including Carboloy cones and spherical spacers. As is depicted more clearly in Figures 3,4,and 5, the structural connection unit ultimately utilized consisted of a hardened 60° steel cone mounted within a setscrew and bearing against a hardened steel platen. The contact diameter of the cone against the platen measured approximately 0.007 inch and was loaded within elastic limits. Adjustment is made by means of turning the setscrew within a mated, threaded hole.

Figure 2 is presented in rather diagrammatic form; however, the diagrammatic configuration emphasizes that it consists of a rotatable member corresponding to the generator 14 of Figure 1 which is "sandwiched" between a pair of generally U-shaped members corresponding to the lower and upper mass members 12 and 13 of Figure 1. The wheel of generator 14 is mounted for rotation about an axis lying in the plane of the drawing. When member 14 is rotated rapidly with respect to the U-shaped members 12 and 13, a kinemassic field is generated which is normal to the plane defined by the rotating member and within the plane of the drawing.

As such, it may be represented in the drawing of Figure 2 as taking a generally counterclockwise direction with respect to the field series circuit members.

Referring once more to Figure 1, it is seen that support for the generator unit 14 is provided by way of a support assembly 17, also fabricated of steel components. The support assembly 17 is in turn clamped to the horizontal structural element 10 by way of bracket assemblies 18.

In the embodiment of the present invention depicted in Figures 1 and 2, the lower and upper mass members 12 and 13 are fashioned into conical sections terminating in conical pole faces 12a and 13a in the area of the detector 15. This configuration tends to maximize the flux density in this area.

For isolation purposes, a curtain of transparent plastic material 19 is positioned so as to geometrically bisect the detector portion of the field circuit from the generator portion thereof. The function of the transparent curtain is to provide a degree of thermal isolation between the generator and detector units. Although not actually shown in Figure 2, the transparent curtain is of H configuration and forms a vertical plane normal to the plane of the drawing and symmetrically positioned with respect thereto.

Not shown in the drawings are a tunnel of transparent material and a film of flexible plastic material which surrounds the detector 15 and associated equipment and thus serve to further stabilize the temperature conditions, thereby diminishing the adverse effects due to thermal gradients.

Before proceeding with the explanation of the operation of the apparatus disclosed in Figures 1 and 1, a more detailed description of certain portions of the structure will be given.

Figures 3, 4, and 5 present the generator assembly 14 of Figures 1 and 2 in greater detail. In particular, these figures disclose the relationship between a freely rotatable wheel 21, a bearing frame 22, and a pair of pole pieces 23. The bearing frame 22 os of structural steel, and functions to spatially orient the three generator parts without shunting the generated field potential.

Positioning of the generator wheel 21 with respect to the cooperative faces of the pole pieces 23 is effected by way of the bearing frame upon which the generator wheel is mounted. In this respect the high-reluctance isolation bridges mentioned with respect to Figures 1 and 2 are herein shown as setscrews 24 which are adjustably positioned to cooperate with hardened steel platens 25. The setscrews 24 are mounted on the pole pieces 23 and are adjustably positioned with respect to steel platens 25 cemented to the bearing frame 22 so as to facilitate the centering of the generator wheel 21 with respect to the interface surfaces 23a of the pole pieces 23.

In the implementation of the present invention the air gap formed between the generator wheel rim flanges and the stationary pole pieces 23 was adjusted to a light-rub relationship when the wheel was slowly rotated; as such this separation was calculated to be 0.001 centimeter for a wheel spin rate of 28,000 rpm due to the resulting hoop tension. In the drawing of Figure 3 the spacing between the pole pieces 23 and the generator wheel rim flange has been greatly exaggerated to indicate that in fact such a spacing does exist.

The generator wheel 21 utilized in the implementation of the present invention has an 8.6 cm diameter and an axial rim dimension of 1.88cm. The rim flange surfaces 21a which are those field emanating areas closely adjacent the surfaces 23a of the pole pieces 23, are each 29.6 square cm. The rim portion of the wheel has a volume of 55.7 cubic cm neglecting the rim turbine slots 21b.

The generator wheel 21 and an associated mounting shaft 26 are mounted of the bearing frame 22 by means of enclosed double sets of matched high speed bearings 27.

Compressed air or nitrogen is used to drive the generator wheel by means of gas impingement against turbine buckets 21b cut in the wheel rim. The compressed gas is supplied through the supply line 28 and emanates from the air jet tube 29. Rate of spin is sensed by light rays reflected from the rim. For this purpose every other quadrant on the rim surface was painted black. Accordingly, light directed at the rim of the wheel will be reflected by the unpainted quadrants into light-sensing cells associated with a rate-measuring circuit of conventional design. Since the rate-detecting means form no part of the present invention they have not been depicted in the actual drawing.

Shaft members 30 carry suitable bearing members 31 for rotatably mounting the generator assembly with respect to a second axis. The support assembly 17 of Figure 1 is partially represented in Figure 4, and, as noted above it provides the mounting means for positioning the generator assembly 14 with respect to the lower and upper mass members 12 and 13.

Before proceeding to an explanation of the operation of the generator assembly with respect to the apparatus of Figure 1, reference is made to Figures 6 and 7 which disclose an enlarged view of the detector 15. The lower and upper mass members 12 and 13 are given a conical configuration so as to maximize kinemassic densities in the area of the working air gap, within which the detector is positioned. Figure 7 represents a sectional view taken across the working air gap, showing the projection of the conical surface of the upper mass member onto the corresponding surface of the lower mass member. Although symmetrical in shape, the projection of the conical surface of the upper mass member onto the corresponding surface of the lower mass member has been slightly reduced for purposes of illustration. In the subject apparatus the

two conical brass pole faces 12a and 13a form a working air gap measuring 0.114 cm across. Each disc shape pole face measures 0.71 square cm in area.

The detector or probe 15 is of indium arsenide and is inserted in the detector air gap with a spacing from either pole face of 0.02 cm, the target thickness measuring 0.07 cm. Both indium and arsenic possess 100% isotope abundance of half integral spin nuclei; arsenic nuclei consist of one isotope of three halves proton spin, while indium nuclei are of two isotopes, both being nine-halves proton spin.

A second probe of similar semi-conductor material 15a is shown in Figure 6 as being positioned in close proximity to the first detector. Both probes 15 and15a are shown mounted on a boom 15b which is shock-mounted by means not shown. Shock mounting of the components is important due to the relatively close spacing between the probe and conical pole faces. Lateral displacement of the second probe from the vicinity of the working air gap measured as 25 cm.

Although not critical to the overall theory of the present invention, the selection of a semi-conductor probe of the nature heretofore described and the effective results realized through the positioning of the probe 14 and the associated probe 15a with respect to the working air gap between the conical pole faces as well as the manner in which signals measured by the two probes is correlated, are important to an understanding of the forces involved. In this respect it is important to realize that the first and second semi-conductor probes were differentially connected in terms of electrical output and are polarity-sensitive to magnetic field measurements. Together the two probes constitute a differential magnetic probe for an FW Bell Gaussmeter. As conventionally used, such probes provide a measure of the magnetic field intensity from both AC and DC sources, via the Hall Effect. The Hall Effect is a well known phenomenon whereby a potential gradient is developed in a direction transverse to the direction of current flow within a conductor when the conductor is positioned in a magnetic field. It should be clearly understood, however, that no magnetic field phenomenon is associated with the present invention. Thus the lateral voltages which are measured in the present arrangement are not Hall voltages. This statement is substantiated by the explanation that follows, clearly establishing the absence of any hall voltage indicative of magnetic fields. In this respect, the two probes are differentially connected for magnetic field measurements to eliminate errors due to ambient magnetic field changes whereas they are additively connected for sensing changes in thermal vibration of crystal lattices. Although polarity sensitive to the magnetic field, the differential magnetic probe is not polarity-sensitive to changes in thermal vibration of crystal lattices.

The fact that the probes are polarity-sensitive with respect to magnetic field but not with respect to the direction of crystal lattice vibrations means that when the probes are reversed with respect to polarity any discernable difference in the output readings might be attributed to a magnetic field induced into the system by the rotating wheel. Inasmuch as the field conductive portions of the apparatus are comprised predominantly of brass which is a paramagnetic material, no appreciable magnetic field should be detected. This in fact corresponds to the actual results in that no measurable difference in magnetic flux was recorded when the polarity of the probe was changed. It is thus possible to realistically discount magnetic fields as influencing operating results.

As seen in Figure 7, the detector 15 has associated therewith two pairs of contacts 32 and 33, the first of which represents current contacts connected in turn to a source of constant current 34 of conventional design. The second set of contacts 33 are voltage contacts connected to detect any potential gradient transverse to the direction of current flow within the detector. The meter 36

represents means for detecting such potential differences and may be in the form of a very sensitive galvanometer.

A thermocouple 35 is positioned in close proximity to the detector 15 to monitor the temperature thereof. Temperature differences, such as recorded by the thermocouple 35, are used for purposes of providing correction figures to the test results. A similar thermocouple is used in conjunction with the second detector 15a, as well as with the upper mass member particularly in the area of the generator wheel. Thermocouples are used for temperature monitoring since the energy change of their conducting electrons, by which they sense temperature change, are not measurably affected by the kinemassic field.

Proceeding now to an explanation of the operation of the subject invention, it will be appreciated that in accordance with the theory of operation of the present apparatus when the generator wheel is made to spin at rates upwards of 10 or 20 thousand rpm, effective polarization of spin nuclei within the wheel structure gradually occurs. This polarization gradually rises to domain-like structures which continue to grow so as to extend their field dipole moment across the interface separating the rim 21 from the pole pieces 23. Secondary dynamic interactions of gravitational coupling between respective dipoles increase the field flux lines around the apparatus field circuit, thus resulting in ever-increasing total nuclear polarization of half integral spin nuclei.

The non-electromagnetic forces so generated within the subject apparatus are directed to the working air gap within which is positioned the semi-conductor probe 15. Therein the kinemassic forces are constructively used to reduce the vibrational degrees of freedom of the crystal lattice structure, resulting in a change of its electrical conductivity property. More specifically, the kinemassic field, due to the dynamic interaction of the gravitational coupling of the mass components of the wheel in relation to the stationary portions of the pole pieces in immediate proximity therewith, is restricted to the relatively high permeability material comprising the lower and upper mass members, and is concentrated at the working air gap by means of the conical pole pieces. Inserted in the air gap is the probe of semiconductor spin nuclei material.

Control circuitry connected to two of the four contacts on the semiconductor probe 15 is designed to maintain a constant current flow across these contacts. At the same time the ambient temperature of the area surrounding the equipment is permitted to increase. In fact the increase in ambient temperature is initiated well in advance of the initiation of rotation of the generator wheel giving rise to the non-electromagnetic kinemassic force field. The constant increase in temperature is meant to mask out otherwise positive and negative temperature variations resulting in a signal-to-noise ratio of measurement.

In light of the gradual and constant increase in temperature of both the equipment and ambient conditions surrounding the equipment, it might be expected that the thermal vibrations of crystal lattice of the semiconductor probe would likewise increase. In actuality, a measurable decrease in crystal lattice vibrations is detected within the semiconductor probe. The actual measurements recorded are in terms of nanovolts of meter movement, and correspond to a decrease in lateral voltages measured across the semiconductor probe. These values can only be accounted for by an effective polarization of the spin nuclei of the lattice structure due to the polarizing effects of the applied kinemassic force field. The polarization results in a change in the specific heat property of the crystal material, which in turn reflects itself as an increase in electrical conductivity measurable by the galvanometer.

Reference is now made to Figure 8 which discloses in graphical relationship the results achieved by various test arrangements of the semiconductor probe with respect to the subject apparatus.

In the interpretation of the graphical relationships of Figure 8 it should be understood that corrections for temperature variations have already been applied. These temperature corrections account for the heat applied to the system, as well as that due to the change in specific heat property of the apparatus due to frictional heating, as well as that due to the change in specific heat property of the apparatus, principally the brass members die to their relative bulk. The later component represents a positive contribution to the ambient temperature due to the decrease in degrees of freedom of the crystal lattice structure of the spin nuclei material when subjected to the kinemassic force field. The above mentioned heat factors result in the increased temperature of the brass members of the apparatus; these increases being monitored by way of thermocouples positioned in proximity to the kinemassic field generating apparatus, member 35 of Figure 7 being an example thereof.

Curve 1 of Figure 8 represents a static test conducted over a period of 150 minutes, values being recorded at 3 minute intervals which was standard procedure for the entire test series. Information gathered in respect to curve 1 was useful in determining compensating factors for ambient temperature changes. In curve 1 as well as each of the other curves of Figure 8, the ordinate values measure a level of thermal vibration, in nanovolts of meter movement, of InAs lattice structure against time in which ambient temperature change of the two probes has been quantitatively compensated.

Curve 2 represents a portion of a standard test run, the portion shown being the active portion of the curve, i.e., that portion of the curve for which measurable results were recorded due to the spinning of the generator wheel. Not included in curve 2 are measurements taken during a 78-minute pre-energizing thermal calibration period typical of the initial portion of each test run conducted. The pre-energizing thermal calibration period is effected in order to illustrate the ambient temperature compensation of the probes and as such is similar to that of the static test of curve 1.

The first 45 minutes of the indicated 150 minute test period of curve 2 represents the time during which the continuity of the negatively sloping curve prior to, during and following the time interval of the wheel returning to its no-spin state, and subsequently (an indication of a return toward thermal equilibrium percentage distribution of spin angular moment) is consistent with the explanation advanced above concerning the force field generated due to the dynamic interaction of relatively moving bodies. It should be noted with respect to curve 2 that separate test runs conducted some 6 weeks apart tend to corroborate the independent test results. The results of the two separate tests are superimposed in curve 2. These two tests, in addition to being spaced in time, were spaced many test runs apart. The two test results further establish the repeatability of the operation.

The change in thermal vibration of the InAs crystal lattice for the test run of curve 2 is approximately equivalent to an11° C reduction in probe temperature. This figure has been substantiated by computer studies. The computer has also been used to statistically analyze the test data and establish the probability of error in terms of the information recorded. In this respect the results of the computerized study indicate a probability of error of 1 in 1 billion. Since any ration in excess of 1 in 20 eliminates the probability of chance occurrence, the results obtained in the present instance should be above reproach.

In order to substantiate the distance dependency of the gravitational coupling force due to the dynamic interaction of relatively moving bodies it was predicted that increasing the separation between the generator rim flange 21a and the cooperating surface of the pole pieces 23a should measurably reduce the results obtained. The results obtained when this separation was increased

to 0.006 cm appears in curve 3. A comparison of these results with those of curve 2 seemingly substantiates the conclusion that upon widening the gap a lessening of the dynamic interaction due to gravitational coupling between the spinning wheel and the stationary pole piece actually occurs.

The data of curve 4 was taken with the air gap separation of the wheel to pole piece established at 0.001 cm as in the arrangement of curve 2; however, the duration of wheel spin was decreased from 45 minutes to 30 minutes. Curve 2 results are shown superimposed on the solid line of curve 4. The relative magnitudes of curves 2 and 4, when so contrasted with their respective wheel spin periods, would appear to indicate a degree of half integral spin nuclei polarization saturation.

Curve 5 depicts the results achieved by way of a shunt test wherein two lead bars were secured to the stationary brass bodies of the generator assembly so as to measure the effect of shunting the field at zones of maximum field potential. As contrasted with the results of curve 2, superimposed thereon, a statistically as well as visually significant difference is associated with the experimental results which, realistically, may be attributed to the shunting effect. The statistical study mentioned above substantiates the distinguishable nature of the data groups resulting in curves 2 and 5.

Curve 6 depicts the results of a test run in which the field permeability has been eliminated by removal from the test apparatus of the upper mass member and the two detector conical pole faces. The lower mass member has also been adjusted downward to as to rest on the horizontal structural element 10. At the same time the spatial relationship between the generator assembly and the two differentially connected probes was not altered. As may be observed from the curve 6, there occurred no change in the thermal vibration of the InAs crystal lattice. The plot scatter observable during the 45 minutes wheel spin period is attributable to increased temperature gradients which developed between the probes and the respective thermocouples in the absence of the various filed circuit member thermal masses.

Further experimental results are available to substantiate the heretofore stated conclusions concerning the operating characteristics of the subject apparatus. In this respect reference is made to the copending application of the present inventor entitled Method & Apparatus for Generating a Secondary Gravitational Force Field, field Nov. 4, 1968 and bearing Serial No. 773,051, the subject of which concerns an apparatus for establishing a time-variant kinemassic force field.

It will be apparent from the foregoing description that there has been provided an apparatus for generating and transforming kinemassic forces due to a dynamic interaction field arising through gravitational coupling of relatively moving bodies. Although in its original application the kinemassic force has been applied to the reduction of thermal vibrations in the lattice structure of a crystal, it should be readily apparent that other more significant uses of these forces are contemplated. In this respect the principles of the present invention may well be applied to any system in which bodies are non-responsive or only partially responsive to conventional forces such as electromagnetic force fields. Thus, the present invention should have particular applicability to the stabilization of plasma particles, pursuant to controlled thermal nuclear fusion, or in the governing of temperatures and thermal energies within matter.

While in accordance with the provisions of the statutes, there has been illustrated and described the best forms of the invention known, it will be apparent to those skilled in the art that changes may be made in the apparatus described without departing from the spirit of the invention as set

forth in the appended claims and that in some cases, certain features of the invention may be used to advantage without a corresponding use of other features.

Having now described the invention, what is claimed as new and for which it is desired to secure Letters Patent is:

(1) An energy generating and transforming apparatus comprising a first member, said first member further comprised of spin nuclei material and mounted so as to be freely rotatable about an axis located within said first member, at least one stationary member, said stationary member comprised of spin nuclei material and positioned immediately adjacent sad first member, and means for effecting the rotation of said first member whereby it is effective in impressing a non-electromagnetic force onto said stationary member.

(2) A method for generating a non-electromagnetic force field and for converting such force field into useful work comprising the steps of mounting a first member comprised of preferred material in a manner which enables said first member to assume a degree of relative motion with respect to a second member also comprised of preferred material, establishing a degree of relative motion between said first and second members, and sensing the resultant energy due to the dynamic interaction of the relatively moving members.

(3) The method of claim 2 wherein the sensing further comprises the steps of positioning a member of preferred material within said non-electromagnetic force field and measuring the change in the physical characteristics thereof.

(4) An apparatus comprising two U-shaped members of spin nuclei material, non-spin nuclei material means for positioning said U-shaped members in mirrored relationship with one another and separated by two gaps, means including a freely rotatable member of spin nuclei material mounted in one of said two gaps, means including a detector mounted in the other one of said two gaps, and means for effecting the rotation of said freely rotatable member whereby a non-electromagnetic force is impressed upon said detector.

(5) The apparatus of claim 4 wherein the detector positioned within the second of said two gaps comprises a crystalline structure of spin nuclei material such that the non-electromagnetic force impressed upon said crystalline structure is effective in polarizing said spin nuclei material sufficiently to reduce the specific heat properties of the crystalline structure so as to effect a substantial increase in the temperature thereof.

(6) An energy generating apparatus comprising a first member, a second member, and means for establishing relative motion between said first and second members whereby a non-electromagnetic force is generated within said first and second members de to the dynamic interaction of said relatively moving members.

(7) An energy generating and transforming apparatus comprising a mass circuit constructed of spin nuclei material of half integral spin value, said mass circuit having two gaps therein, field generating means rotatably mounted in one of said mass circuit gaps, said field generator means further comprising a frame for rotatably mounting thereon a member comprising spin nuclei material of half integral spin value, the axis of rotation of said rotatable member lying in the plane of said mass circuit, said pole pieces being disposed on said frame on opposite side of said rotatable member, each pole piece presenting a generally circular face in close proximity to but spaced from a face of said rotatable member, said pole pieces being further configured to substantially fill the gap in said mass circuit, means for rotating the rotatable member of said field generator means at high velocity, and means mounted in the other gap of said mass circuit for detecting a field in said circuit.

(8) An energy generating and transforming apparatus comprising: a mass circuit of dense material, and having two gaps therein, mounting means for said mass circuit, mounting means having restricted contact area with said mass circuit, field generator means rotatably mounted in one of said mass circuit gaps; said generator means further comprising a frame, a rotatable member mounted on said frame for rotation, the axis of rotation of said rotatable member lying in a plane of said of said mass circuit throughout all relative positions of said frame, a pair of pole pieces mounted on said frame by mounting means establishing restricted contact area between each pole piece and said frame, said pole pieces being further configured to substantially fill the gap in said mass circuit, means for rotating the rotatable member of said generator means at high velocity, an means mounted in the other gap of said mass circuit for demonstrating a change in physical characteristics within said gap region due to the field generated within said mass circuit.

(9) The apparatus of claim 8, wherein said means mounted in the other gap of said mass circuit comprises a member whose atomic structure is such that it is affected by said field generated within said mass circuit.

(10) A method for controlling the temperature in a crystalline structure by subjecting the crystalline structure to non-electromagnetic forces capable of altering the specific heat properties thereof, including the steps of: connecting in field series relation a mass circuit constructed of dense spin nuclei material of half integral spin value, a field generator constructed essentially of spin nuclei material having a half integral spin value and rotatably mounted in one of said mass circuit gaps, and a crystalline structure also of spin nuclei material having a half integral spin value positioned in the other of said mass circuit gaps; initiating the rotation of said field generator whereby the external angular momentum of spin nuclei material within said rotating field generator interacts with inertial space to effect the polarization of the spin nuclei thereof, resulting in turn in a net component of angular momentum which dynamically interacts with the spin nuclei of the mass circuit thereby further polarizing the nuclei of the material therein; and concentrating the resultant field within said field series circuit onto said crystalline structure within the second of said mass circuit gaps whereby the spin nuclei material of said crystalline structure is sufficiently polarized to reduce the specific heat properties of the crystalline material due to a reduction in degrees of freedom of the lattice vibrations thereby effecting a substantial temperature increase in the body thereof.

US Patent # 3,823,570

Heat Pump

Henry W. Wallace

July 16, 1974
US Cl. 62/56, 62/3, 62/467, 35/15
Intl. Cl. F25d

Abstract -- Method & Apparatus for utilizing for the purpose of heat flow by means of controlled temperature change a field energy, other than electric, magnetic or gravitational field energies, capable of reducing the specific heat properties of a broad class of substances.

Description

The present invention pertains to manipulation of atomic nuclear structure so as to modify the state of an energy transfer medium, and utilization of the modified medium. More particularly,

the invention pertain to effecting reorientation of nucleons of a material whose spin number (1) is half-integral, and imposing the effect of such orientation on a medium adapted to do productive work.

In the past century great strides have been made in harnessing the three degrees of translational movement of electrons in the electromagnetic regime. Very little if anything has been done to utilize the inertial regime comprising the relatively massive nucleons, and particularly the three degrees of rotational freedom thereof, one of which is preempted by nuclear spin.

In my US Patent # 3,626,606, I demonstrated how, by applying a rotational force to material whose nuclear spin number (I) is half-integral, a reorientation can be achieved in the nuclear structure. In my US Patent # 3,626,605, I demonstrated how a time variant may be imposed on the output resulting from such reorientation.

It immediately becomes evident that there are potentially many, many uses of these reoriented nucleons. In all probability, techniques will be found which t some extent parallel those employed for utilization of the electron in the electromagnetic field, and it becomes clear that the thus reoriented nuclear structure may lend itself to such uses as modification of the gravitational field acting on a body so as to alter its gravitational attraction toward another body, separation of isotopes by distinguishing between nuclei according to their nucleon content, generating of gravity waves for communication and other energy transfer, stabilizing of plasma and maintenance of plasma density for controlled nuclear fusion, possible harnessing of cosmic gravitational energy in addition to utilization in many, many other fields.

For purposes of demonstration the utilization of the inventio0n in heat pumps will be explained. For brevity, material whose spin number (I) is half-integral will be referred to hereafter as "spin nuclei material". As in US Patent # 3,626,605 and 3,636,606, the generated field will be referred to as a "kinemassic field".

The Spin Values (I) for the isotopic forms of the elements are well known and may be found in tabular form, for example, "The NMR Table, 5th Edition" published by Varian Associates of Palo Alto, CA. Typical among substances in elemental form having such half integral spin values are beryllium with a neutron spin of I - 3/2, aluminum with a proton spin of I = 5/2, chlorine of which both isotopes provide proton spins of I -3/2, vanadium (useful for alloys) of which one isotope of 99.76% abundance provides a proton spin of I = 7/2, cobalt with a proton spin of I - 7/2, copper of which both isotopes provide spin of I = 3/2, and bromine of which both isotopes provide spins of I = 3/2. These chemical elements and others of half integral spin values may be alloyed together as well as to elements possessing no-spin and integral spin nuclei provided quantity percentages of such additional elements are small.

In US Patent # 3,626,606 it was explained that the kinemassic force resulting from this dynamic interaction of relatively moving bodies of spin nuclei material can be utilized for temperature control purposes including the specific application of such kinemassic forces to the control of lattice vibrations within a crystalline structure thereby establishing an appreciable temperature reduction, these principles being useful, for example, in the design of a heat pump.

The half-integral spin nucleus of this spin nuclei material is characterized by possession of an odd nucleon, either neutron or proton, which is consequently unpaired. The remainder of the nucleons of such a half-integral spin nucleus are acted upon by both the short-range force and the weaker long-range force which together constitute the nuclear binding force. The unpaired nucleon is acted upon only by the weaker long-range force and it is the energy of the absent short-range force characterizing the half-integral spin nucleus contained therein due to their

absent short-range force nuclear energy causing an available, responsive energy, this polarization resulting in a diminishing of the lattice vibrations within said crystalline structure.

The kinemassic field may be utilized in static form for reducing the specific heat of such spin nuclei material. Establishing of this static field energy within said atomic structure effectively reduces its specific heat capacity concomitantly causing a controlled temperature increase therein due to the presence of the substance's enthalpy content. Concomitantly there is caused to occur a decrease of temperature which is possessed prior to application of the static field energy. This below-ambient temperature is caused by the now-reduced enthalpy content which resulted from the heat flow away from the substance which had occurred when it contained the static field energy. As a consequence heat now flows back into this substance from the ambient substance of higher temperature.

It is provided for in this invention that the substance, with its controllable specific heat property, be capable of physical transport from one spatial location to another. However, for the following explanation these locations will be limited to two in number. For both spatial locations, the ambient substance possesses an adequate thermal conductivity property. If now the static field energy is caused to be present within the transportable substance of controlled variable specific heat property, when at the first of these spatial locations but removed from this substance when it has been transported to the second of these locations, it is evident that heat flow from the transportable substance into the ambient substance will always occur at the first location identified by the presence of the static field energy and that heat flow from the ambient substance into the transportable substance will always occur at the second location identified by the absence of the static field energy. It is then apparent that the transported substance of spin nuclei material alternately and cyclically experiences temperature changes such that, at the designated first location, its temperature exists at a value higher than that of the temperature of the ambient substance and also, at the designated location, that its temperature exists at a lower value than that of the temperature of the ambient substance. This one-way heat flow from the transported substance into the ambient substance of the designated first location in combination with the one-way heat flow from the ambient substance of the designated second location into the transported substance, this dual heat flow phenomenon, then constitutes a heat pump.

Although several techniques are known for altering specific heat, such as changing the density of a gas, the technique utilized in this invention concerns the limiting of the degrees of freedom of particle vibration of a substance by means of a static energy field. More specifically, consider the thermal vibration of a crystal structure. The assembly of atoms bound together by local atomic forces, composing a crystal lattice, is capable of vibrating in a large number of independent normal modes about a static equilibrium configuration. In these vibrations a large portion of the enthalpy is stored; these vibrations are the major contribution to the structure's specific heat.

One object of this invention is to utilize the so-called kinemassic force to alter the energy state of a relatively movable medium.

A further object of the invention is to condition spin nuclei material so that it will alternately cause heat to flow out of it and into it by means of a temperature change.

A further object is to utilize the kinemassic force field concept in a heat pump.

According to the present invention there is provided a method of modifying the energy state of a relatively movable transfer medium, which comprises applying to a material whose nuclear spin number (I) is half-integral a force which reorients nucleons thereof, exerting on a transfer device a force resulting from said orientation, and exposing said relatively movable transfer medium to said device to effect said modification of the energy state of said medium.

The invention also provides a heat pump comprising a rapidly rotatable generator formed of spin nuclei material closely juxtaposed to said generator and forming therewith a closed field circuit, and heat transfer means formed of spin nuclei material and adapted to move through the vicinity of said relatively stationary body whereby the specific heat of said heat transfer means is altered to accomplish useful work.

In order that the disclosure will be more fully understood and readily carried into effect, the following detailed description is given with reference to the accompanying drawings in which:

Figure 1 is an end view, with housing partly removed, of a heat pump according to the present invention.

FIG. 1

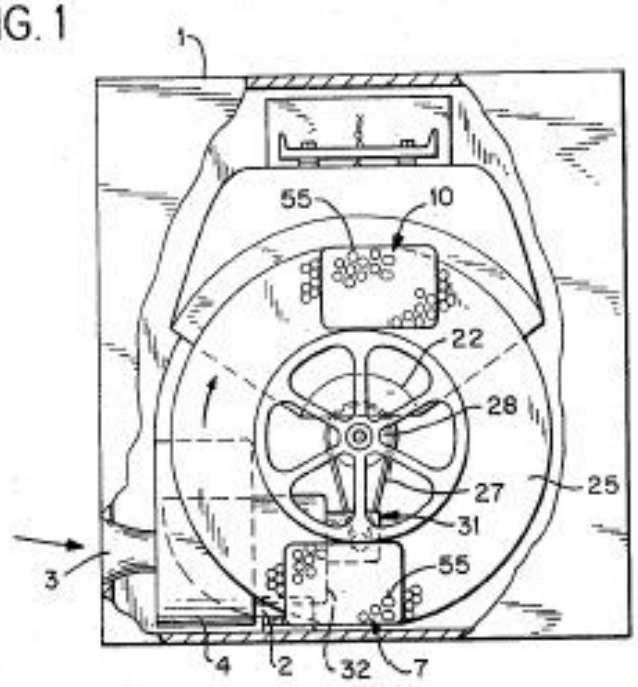


Figure 2 is a side view, with housing partly removed, of the heat pump shown in Figure 1.

FIG. 2

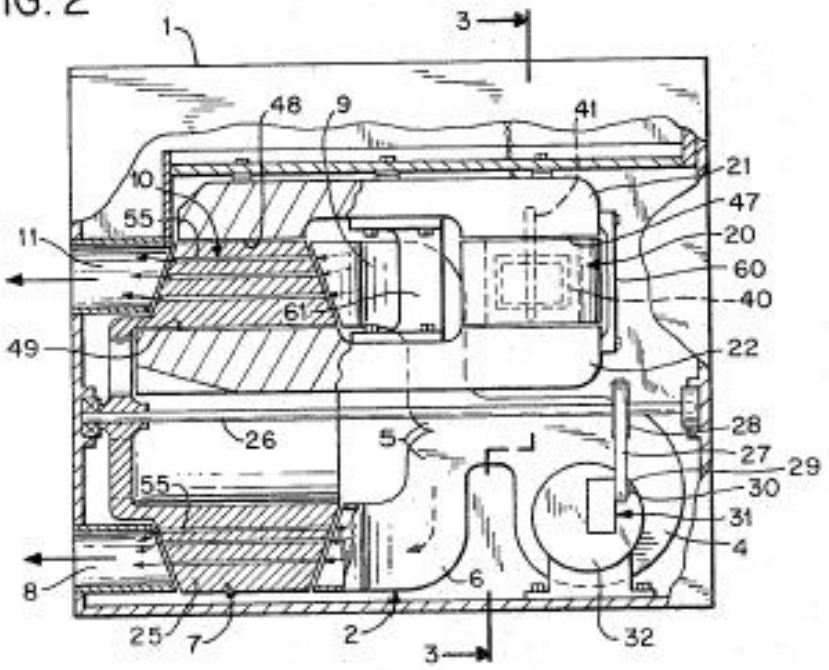


Figure 3 is a sectional view taken along the line 3-3 of Figure 2.

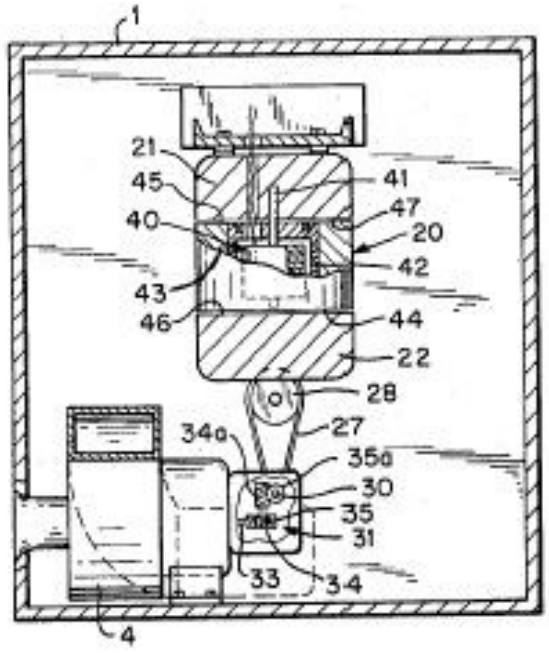


Figure 4 is an end view, with housing partly removed, of the heat pump shown in Figure 1.

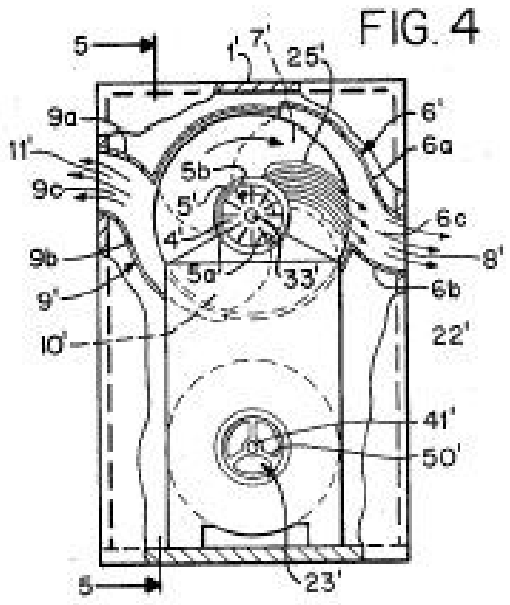


Figure 5 is a sectional side view taken along line 5-5 of Figure 4.

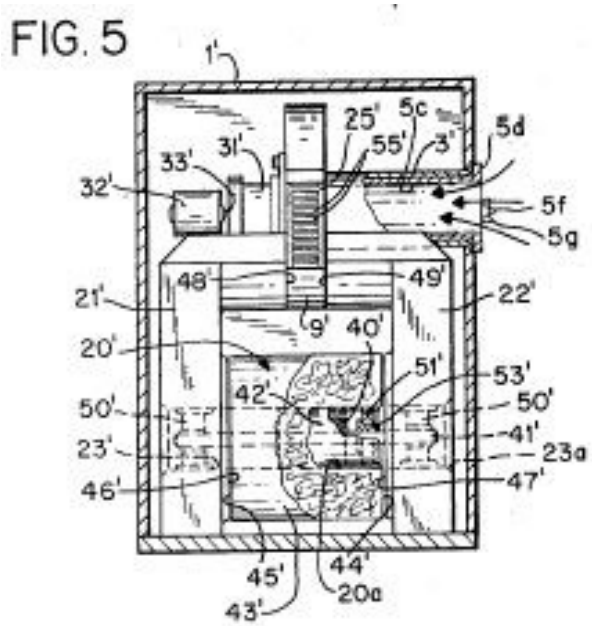


Figure 5A is a detailed view of a portion of Figure 5.

FIG. 5A

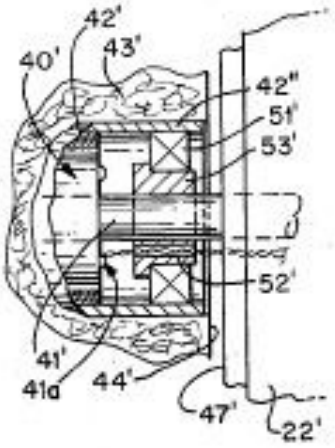


Figure 5B is a parallel perspective view of a component part of Figure 5.

FIG. 5B

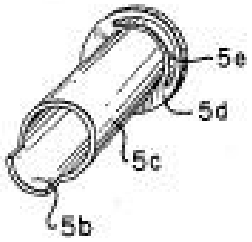
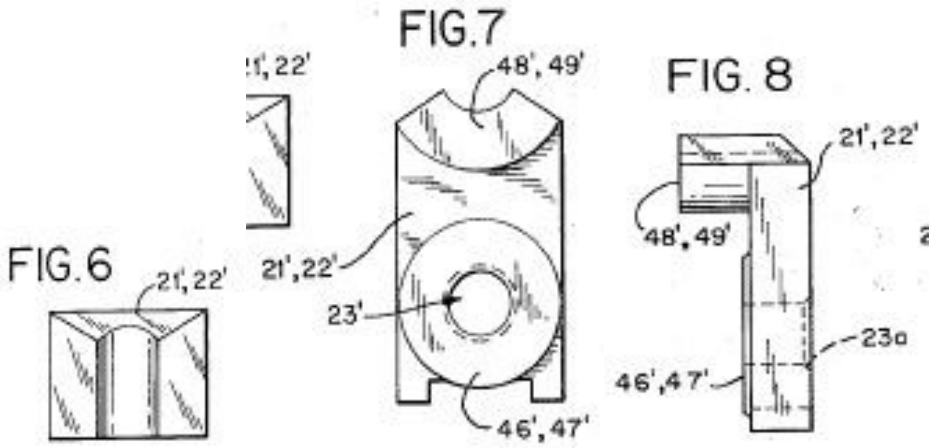


Figure 6, 7, 8 and 9 show respectively top, front, side and rear views of symmetrical field circuit segments employed in the embodiment of Figures 4 and 5.



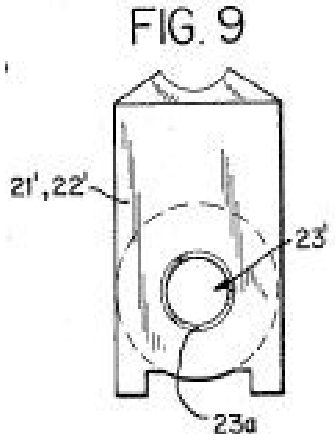


Figure 10 is an end view of a further modification of the invention.

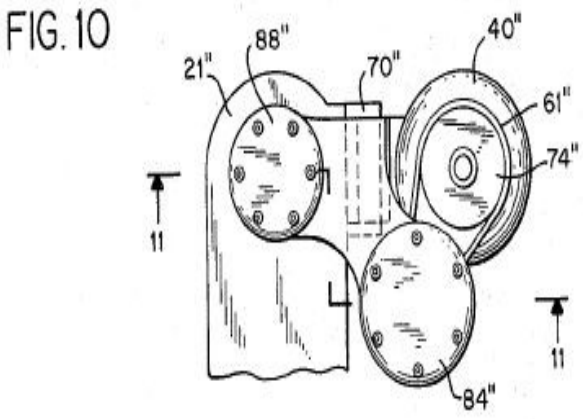


Figure 11 is a sectional view taken along the line 11-11 of Figure 10, and

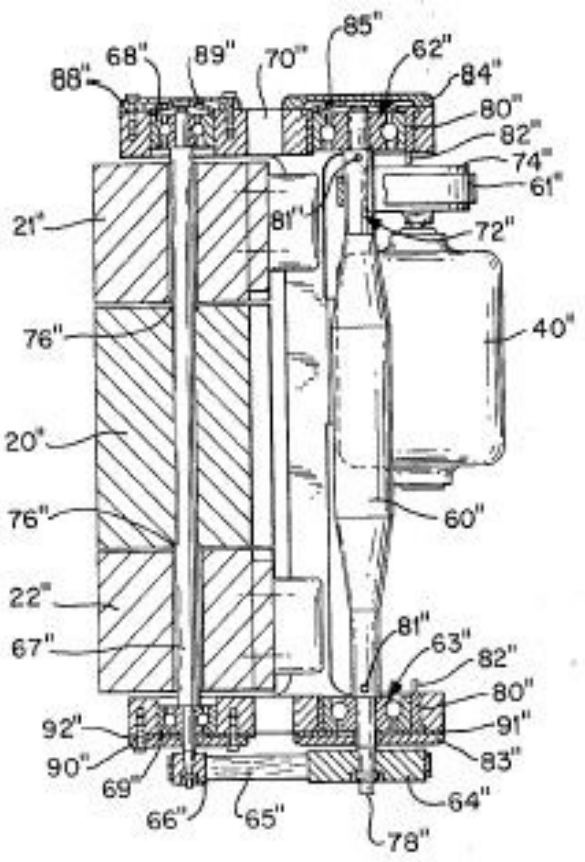
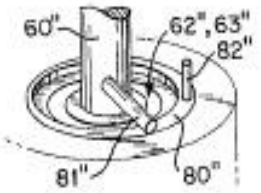


Figure 12 is a detailed view of one aspect of the eccentric adjustment.

FIG. 12



Figures 1 to 3 show a solid-state heat pump. As disclosed in Figures 1 and 2, housing 1 encloses a duct system 2. Air or other fluid is conducted through inlet 3 and into blower 4. Air under pressure emerging from blower 4 is conducted to manifold 5 where it is divided into two air streams, one of which flows through lower duct 6 to reduced-temperature heat flow zone 7 and then to exhaust outlet 8. The other stream of air from manifold 5 flows upwardly through upper duct 9 to increased-temperature heat flow zone 10 and then to exhaust outlet 11.

The kinemassic force, which is utilized in accordance with the invention to effect the desired heat flow is generated in a kinemassic generator rotor 20. Portions of an upper field circuit segment 21 and a lower field circuit segment 22 are juxtaposed to rotor 20 to form therewith a

part of a kinemassic field circuit. At the increased temperature heat flow zone 10 a heat flow is effected with air or other fluid as hereinafter described.

To achieve this heat flow, an enthalpy transfer ring 25 is rotatable on a shaft 26 driven by a belt 27 through a pulley 28 mounted on said shaft 26. Said belt 27, in turn, is driven by a pulley 29 mounted on a shaft 30 forming a part of a gear reduction assembly 31. Blower 4 is driven by blower motor 32 which is also connected to a rotor shaft 33 (Figure 3) and worm gear 34 through a worm wheel 35 which is integral with a second worm gear 35 which is integral with a second worm gear 34a which, in turn, drives a worm wheel 35a connected to shaft 30.

As seen in Figure 3 the kinemassic generator rotor 20 includes a generator drive motor 40 which, in the present embodiment, is shown as an inside-out electric motor having shaft 41 mounted integrally on upper field circuit segment 21. The motor may, for example, be a hysteresis type motor and driven by a solid stage frequency-controlled source.

The outer housing 42 of drive motor 40 is adapted to rotate and has integrally mounted thereon a cylindrical generator rotor member 43 formed of spin nuclei-containing material. Drive motor 40 is adapted to rotate cylindrical generator rotor member 43 at extremely high rates of rotation. The kinemotive force generated is a direct function of rate of rotation, so that it is desirable to achieve the highest rate of rotation compatible with the permissible stresses in the system. These stresses vary with the physical size and proportions of said cylindrical generator rotor member 43 and the material of which it is composed. Such rates of rotation can range from approximately 30,000 rpm to values of 100,000 rpm or greater, the lower limit preferably being in the neighborhood of 50,000 rpm.

Cylindrical generator rotor member 43 is formed with a flat pole face surfaces identified as generator lower pole-face 44 and generator upper pole-face 45 at its lower and upper ends respectively which are juxtaposed to flat pole face surfaces identified as lower field pole-face 46 and upper field pole-face 47 forming a part respectively of lower field circuit segment 22 and upper field circuit segment 21. It is essential to maintain air gaps of minimum width between pole face surfaces 44, 46 and between pole face surfaces 45, 47 in order to provide maximum kinemassic field permeability as well as to optimize the secondary interaction of kinemassic field generating.

The upper and lower field circuit segments 21 and 22 are formed of spin nuclei-containing material and each terminates adjacent enthalpy transfer ring 25 as upper enthalpy transfer pole-face 48 and lower enthalpy transfer pole face 49, respectively. The pole faces 48 and 49 are cylindrical surface segments and are equal in surface area. As seen in Figures 1 and 2, these respective pole faces 48 and 49 so encompass a portion of enthalpy transfer ring 25. In order to minimize reluctance, the respective air gaps formed by pole faces 48 and 49 and the juxtaposed portion of enthalpy transfer ring 25 should be of minimum air gap width.

Enthalpy transfer ring 25 is provided with a multiplicity of enthalpy transfer surfaces which may be in the form of tubular channels 55 which, in part, function to increase the enthalpy transfer surface area resulting in greater heat flow between the enthalpy transfer ring 25 and an enthalpy transfer fluid which is caused by blower 4 to flow through duct 9, through these tubular channels 55 and then to exhaust outlet 11. The tubular channels 55, only a few typical ones of which are shown, have a second function of reducing the cross-sectional area of a kinemassic field circuit in the increased-temperature heat flow zone 10 in order to increase the flux density within the permeable portion of ring 25 within zone 10 while imparting a minimum increased reluctance to the overall field circuit. This increased flux density within the permeable portion of ring 25

within zone 10 results in greater reduction of the specific heat of ring 25 within zone 10. The tubular channels 55 may be variously configured and distributed to achieve the foregoing results.

End plate 60 may be accurately pinned then bolted to circuit segments 21 and 22 to maintain the air gaps in position and to support segment 22. Also, connecting block 61 is provided at an intermediate position between segments 21 and 22 for the same purpose.

In operation, after the kinemassic generator rotor 20 has been caused to spin at a high rate of rotation, air fed through inlet 3 I propelled by blower 4 to manifold 5 where it is subdivided into a lower stream flowing through duct 6 and an upper stream flowing through duct 9.

The enthalpy transfer ting 25, which rotates at a suitably low speed, for example, 1 rpm, will undergo a reduction in specific heat in any given portion and then under the influence of the kinemassic force extending between pole faces 48 and 49. The air passing through upper duct 9 will be forced through those tubular channels 55 which are at the instant in the increased-temperature heat flow zone 10 adjacent pole pieces 48 and 49 with the result that the air will experience a temperature rise occurring in said given portion of enthalpy transfer ring 25 due to the reduction of its specific heat arising from the polarization of its spin nuclei under the influence of the kinemassic force, whereby the air which emerges from exhaust outlet 11 will possess a temperature higher than its temperature possessed when it previously flowed through duct 9.

As enthalpy transfer ring 25 continues to rotate, so that said portion thereof departs from the spin nuclei polarizing effect of the kinemassic field flux lines of zone 10, the specific heat will increase again to its normal value thereby causing the temperature of said given portion to drop below that value existent prior to entering zone 10 because of the reduced enthalpy now contained therein. The lower stream of air is forced from duct 6 through those tubular channels 55 in the reduced-temperature heat flow zone 7 with the result that said given portion of enthalpy transfer ring 25, due to its changed state of increased specific heat, will absorb heat from the ambient flowing air, as said given portion of ring 25 reaches zone 7, the result being that the air emerges from outlet 8 with a temperature lower than that temperature possessed when it was flowing through duct 6. IT will be noted, as can be seen from Figure 2, that the increased-temperature heat flow zone 10 is offset, with respect to the vertical, from reduced-temperature heat flow zone 7, this offsetting being desirable for optimum coordination of the specific heat reduction and recovery times respectively of the chosen material forming ring 25 in its passage into and from the zone 10. The positions and configuration of zones 7 and 10 may be varied depending on the specific heat properties of the material forming ring 25.

Turning now to the embodiment of Figures 4 to 9, the same reference numbers have been used, so far as possible, as in Figures 1 to 3 but with primes. The housing 1' encloses a duct system comprising an inlet duct 3', best shown in Figure 5, which leads air to a rotary blower 4' mounted on rotor shaft 33' driven by blower motor 32' through, but bypassing, a drive unit 31' which may be, if desired and as shown, in the form of a harmonic drive unit manufactured by USM Corporation of Shelton, CT.

An enthalpy transfer ring 25' is also mounted for rotation about rotor shaft 33', and is driven by blower motor 32' through drive unit 31' in counter-rotation to rotary blower 4'. While the rate of rotation of rotary blower 4' is preferably between 1745 and 3500 rpm, the rate of counter-rotation of enthalpy transfer ring 25' is relatively slow, for example, one to several rpm. A reduced-temperature duct 6' for leading cooled air from the system to an exhaust 8' is formed by upper baffle 6a and lower baffle 6b and side baffle 6c as shown in Figure 4 and another similar side baffle (not shown), the width of duct 6' being sufficient to snugly overlap enthalpy transfer ring

25'. Similarly, an increased-temperature duct 9' for leading heated air from the system to an exhaust 11' is formed by upper baffle 9a, lower baffle 9b, side baffle 9c, and another side baffle (not shown), the width of duct 9' also being sufficient to snugly overlap enthalpy transfer ring 25'.

Kinemassic generator rotor 20' is provided for generating the desired kinemassic force. As seen in Figures 5 and 5A, the rotor 20' includes a generator drive motor 40' which may be of the so-called "inside-out" type having a stationary shaft 41' on which is mounted a winding 41a. The drive motor 40' may be powered by a generator or solid-state frequency converter (not shown) preferably with an output frequency of approximately 1234 cps. In this embodiment an oil mist supply (also not shown) should be provided for bearing lubrication). The oil mist can, for example, be delivered by a small size air compressor unit. Concentrically mounted on shaft 41' is a rotatable outer iron rotor and conductor cage 42' fitted into housing 42" of generator drive motor 40'. Integrally mounted on said rotatable iron rotor and outer conductor cage 42' is a cylindrical generator rotor member 43' formed of spin-nuclei containing material. Cylindrical generator member 43' is formed with flat pole faces 44' and 45'. Juxtaposed thereto are flat field pole faces 46' and 47' of field circuit segments 21' and 22' formed of spin-nuclei containing material and adapted to provide a path for kinemassic flux between generator rotor member 43' and transfer ring 25'. It is essential to maintain air gaps of minimum width between pole-face surfaces 44', 47' and between pole-face surfaces 45', 46' in order to provide maximum kinemassic field circuit permeability, the width of the air gaps in the drawings being exaggerated for clarity.

The rotor 20' is provided with an axial cylindrical recess 20a adapted to mate with axial cylindrical recesses 23' provided in the field circuit segments 21' and 22' being beveled as shown in Figure 5. Fitted into each of the recesses 23' are respective shaft mounts 50' which non-rotatably secure the shaft 41' to segments 21' and 22', the motor 40' fitting firmly within axial cylindrical recess 20a. The motor 40' may, for example, be a hysteresis type motor driven by a solid-state frequency controlled source. The outer iron rotor and conductor cage 42' of motor 40' rotates about the stationary motor shaft 41' through its mounting on generator drive motor bearings 51' of which there are a pair but only one of which is shown. A concentric bearing block 53' associated with each of the bearings 51' contain s in the illustrated block the power leads for the generator drive motor 40' through power lead channel 52'.

The identical first and second field circuit segments 21' and 22' each terminate adjacent enthalpy transfer ring 25' as first enthalpy transfer pole-face 48' and second enthalpy transfer pole-face 49' respectively. The first enthalpy transfer pole-face 48' and the second enthalpy transfer pole-face 49', in this embodiment, are identical in configuration and having flat surfaces and are of hollow circular segment form as best shown in Figures 6 to 9. As seen in Figures 4 and 5, these respective pole-faces 48' and 49' so encompass a portion of enthalpy transfer ring 25' about portions of its flange surfaces that they provide for minimum kinemassic reluctance of the flux lines passing through that portion of enthalpy transfer ring 25'. The respective air gaps formed by pole-faces 48' and 49' and the adjacent flanges of enthalpy transfer ring 25' should be of minimum width. Enthalpy transfer ring 25' is provided with a multiplicity of enthalpy transfer channels which may be in the form of involute channels 55', the involute surfaces of which may be described by the x,y coordinate equations:

$x - a \cos ø + a ø \sin ø$ and $y = a \text{ sm } ø - a ø \cos ø$

where "a" is the inner radius of the enthalpy transfer ring 25' and ø is the polar angle described between the starting point and tangent point of a string which is kept taut while being unwound from a cylindrical surface of radius "a", the curve formed by the string end describing the

involute surface of the channel. Such an involute channel in conjunction with the counter-rotating relation between blower 4' and enthalpy transfer ring 25' serve to enhance the enthalpy transfer effect between involute surface and the fluid due to the surface impingement arising from the angular paths required of the fluid particles. More important, the involute channels 55' permit a uniform cross-section of field permeable material distribution from inner radius to outer radius of the enthalpy transfer ring 25' while also causing the kinemassic field flux density increase described for the first embodiment.

As shown in Figure 4, the periphery of blower 4' is partially surrounded by fixed shrouds 5a and an adjustable shroud 5b adapted to control the amount of air flowing into ducts 6' and 9'. The adjustable shroud 5b is attached by bolt and slot connections to the housing of blower 4'. The adjustable shroud 5b is integral with inlet sleeve 5c as shown in Figure 5B in parallel perspective. Inlet sleeve 5c is designed to concentrically nest, in a rotatable sliding relation, within inlet duct 3' as shown in Figure 5. Flange 5d of inlet sleeve 5c possesses an arc slot 5e of a sufficient number of angular degrees that, in conjunction with a bolt stud 5f secured to housing 1' and extending through arc slot 5e in combination with wing nut 5g, adjustable shroud 5b can be fixed in any required angular orientation so as to apportion the air flow in cooperation with shrouds 5a into ducts 6' and 9'.

In operation air under pressure emerging from blower 4' is divided into two air streams by means of the shrouds 5a and 5b. One air stream flows directly into a reduced-temperature enthalpy transfer zone 7' and then through reduced-temperature duct 6' to exhaust 8'. The second air stream flows directly into increased-temperature enthalpy transfer zone 10' and then through increased-temperature duct 9' to exhaust 11'. The fixed shrouds 5a are carefully positioned for directing the air into the two enthalpy transfer zones 7' and 10'. The number of involute channels 55' which are effective at any one time to pass air through enthalpy transfer zones 7' and 10' can be adjusted by varying the setting of movable shroud 5b. By adjusting said shroud 5b so as to reduce the air flow rate through the reduced-temperature enthalpy transfer zone 7', while simultaneously increasing air flow rate through the increased-temperature enthalpy transfer zone 10', a lesser amount of enthalpy will be transferred out of said ring within the increased-temperature enthalpy transfer zone 10', thus resulting in a gradually increasing enthalpy deficit in enthalpy transfer ring 25'. This will then cause the mean temperature of the enthalpy transfer ring 25' to reduce until there is no longer an imbalance between the rate of enthalpy introduced and the rate of enthalpy removed from enthalpy transfer ring 25'. Thus, there is provided a self-stabilizing system since the temperature difference between the ambient temperature air, arriving through inlet duct 3' into the involute channels 55' within the increased-temperature enthalpy transfer zone 10', and the surface temperature of the involute channels 55' will diminish as the average temperature of the enthalpy transfer ring 25' reduces.

The extremes of temperature difference of enthalpy transfer ring 25', occurring between the maximum existent in those involute channels 55' located in enthalpy transfer zone 10' and the minimum existent in those involute channels 55' located in the enthalpy transfer zone 7', not only are dependent upon their temperature values above 0° K as reflected by the average temperature of enthalpy transfer ring 25', but also by the particular half-integral spin nuclei utilized in the enthalpy transfer ring 25'. These temperature differences are therefore limited and consequently determined by the temperature at which self-stabilization will occur as exemplified by that state where the temperature of the air or other fluid entering inlet duct 3' is of the same value as that temperature of the involute channels 55' located in the enthalpy zone 10'. That temperature at which self-stabilization occurs can be significantly lowered by returning to inlet duct 3', by means of commonplace ducting and therefore not shown, a portion of the lower temperature air

leaving reduced-temperature duct 6' to exhaust 8'. Thus the average temperature of enthalpy transfer ring 25' can be lowered to a value considerably greater than that temperature difference existent in enthalpy transfer ring 25' between its maximum and minimum values at any moment of time.

It is therefore significant to note that a reduction of the enthalpy transfer ring 25 or 25' mean temperature of from 70° to 35° F represents a reduction of only 6.6% with respect to 0° K and that this technique of heat pumping via cyclic changing of a material specific heat by way of the kinemassic field force is not restricted to a narrow temperature range as is the case in the conventional heat pump with its narrow limits of temperature-pressure parameters required for boiling and condensing states. For example, the temperature difference between the inflowing air or other fluid entering inlet duct 3' and the outgoing air or fluid leaving exhaust 8' can thus be increased by adjusting the blower motor movable shroud 5b, or by other equivalent controls, so as to reduce the air or fluid rate of flow through those involute channels 55' located within the reduced-temperature enthalpy transfer zone 7' and simultaneously increasing the air or fluid rate through those involute channels located within the increased-temperature enthalpy transfer zone 10' while causing the temperature of the outgoing air or other fluid of exhaust 8' to be progressively lowered by means of the reintroduction of a portion of this reduced-temperature air or other fluid of exhaust 8' back into the inlet duct 3'.

Conversely, if it is desired to increase the air or fluid temperature difference between the inflowing air or fluid entering inlet duct 3' and the outgoing air or fluid leaving increased-temperature duct 9' while progressively increasing the temperature of the outgoing air or other fluid of exhaust 11', the blower motor movable shroud 5b is adjusted so as to reduce the air or fluid flow rate through the increased-temperature enthalpy transfer zone 10' and simultaneously increasing the air or fluid flow rate through the decreased-temperature enthalpy transfer zone 7' while reintroducing a portion of this increased-temperature air or other fluid of exhaust 11' back into inlet duct 3', this resulting in a mean temperature increase of the enthalpy transfer ring 25'.

Blower motor movable shroud 5b may also be adjusted by a temperature-responsive servo drive system of conventional design and therefore not shown, which is temperature sensitive to the air or other fluid leaving exhaust 8' or to that of an enclosure, whose temperature is being controlled by this air or other fluid, thus providing an especially effective means of removing enthalpy from a solid or fluid through a broad temperature range. Such a conventional servo system can also be applied to the air or other fluid leaving exhaust 11' or elsewhere that temperature feedback is possible in order more effectively to establish and control elevated temperatures. Where system performance is closely repeatable, a simple time-controlled mechanism may be substituted for either servo system application in driving the blower motor movable shroud 5b.

Referring to the embodiment shown in Figures 10, 11 and 12 a modified kinemassic force generator system is shown to demonstrate advantages to be gained by the presence of additional, usable spin nuclei material at lesser inner diameters occupied by the generator drive motors 40 and 40' in the other embodiments and by increasing in the axial direction the length of the generator rotor 20", such increase being possible without adding to the centrifugal force on the material forming the generator rotor 20" thereby causing a kinemotive force of greater magnitude to occur for a given set of air gaps formed between a generator rotor 20" and field circuit segments 21" and 22".

Field circuit segments 21" and 22" are shown juxtaposed to end surfaces of generator rotor 20' in a manner similar to the juxtaposition of segments 21' and 22' to generator 20' in Figure 5. Field circuit segment 21" is shown in fragmentary form in Figure 10 to indicate that various uses may

be made of the output of generator rotor 20". For example, by suitable configuration of segments 21" and 22" the kinemassic force may be led to a transfer ring such as transfer ring 25' of Figure 4.

In the present embodiment, generator drive motor 40" drives a spindle 60" through the intermediary of a belt 61", said spindle 60" being rotatable in suitable bearing assemblies 62" and 63". Mounted at the end of spindle 60" opposite belt 61" is a drive pulley 64" which is connected by a belt 65" to a driven pulley 66" secured to a drive shaft 67" adapted to rotate generator rotor 20". Drive shaft 67" is rotatably mounted in suitable bearing assemblies 68" and 69" supported in a generator drive chassis 70" together with bearing assemblies 62" and 63".

Typical specifications for generator rotor 20" may be that it be formed of aluminum alloy with 15.24 cm outside diameter and 20.32 cm axial length. Shaft 67" may be of steel with 19 mm outside diameter. Shaft 67" may be push-fit and secured to generator rotor 20" with an epoxy adhesive. Generator rotor 20" may be designed to rotate at 48,300 rpm. To achieve this angular velocity, drive motor 40" may be a one-sixth HP capacitor start, induction run type 115 VAC single phase 3450 rpm rated motor.

The spindle 60" may be provided with a pulley section 72" adapted to be rotationally engaged by belt 61". Pulley 74" driven by motor 40" and adapted to drive belt 61" may be a low-speed 8.89 cm diameter minimal crown type. Belt 61" may be of seamless polyflex material. The outside diameter of pulley section 72" may be 2.54 cm thus providing a 3.5 to 1 ratio between pulley section 72" and pulley 74". Thus, spindle 60" will be driven at 12,075 rpm.

Pulley 64" may be of intermediate-speed 10.2 cm diameter minimal crown type. Pulley 66" may be of high-speed 2.54 cm diameter type, thus providing a 4 to 1 ratio between pulley 66" and pulley 64".

The field circuit segments 21" and 22" may be formed of cast aluminum. The air gaps between segments 21" and 22" and generator 20" should advantageously be held to 0.005 mm., but are exaggerated for clarity. Chamfers 76" on each end of generator 20" should be 45° x 1.6 mm.

The driving pulley 64" may be secured to spindle 60" by cap lock nut 78". Bearing assemblies 62" and 63" may each be provided with eccentric rollers 80" adapted to be adjusted by pin sets 81" and 82" for belt tension control as shown in Figure 12. Pin sets 81" and 82", only one set being depicted in Figure 12, assure equal degrees of eccentricity adjustment of eccentric collars 80" thus maintaining a parallel orientation between the respective axes of spindle 60" and drive shaft 67" while adjusting their separation distance for the purpose of tension control of belt 65". After such adjustment, pin sets 81" and 82" are removed and the proper tensioning of belt 61" is caused by means of laterally moving the generator drive motor 40" with respect to generator drive chassis 70" by conventional means. Bearing assembly 63" is provided with bearing thrust cap 83". Bearing assembly 62" is provided with spring thrust cap 84" and thrust spring 85" which may be a disc-type spring.

Bearing assembly 68" may be provided with spring positioning cap 88" and thrust spring 89 which may be a disc-type spring. Bearing assembly 69" may be provided with bearing positioning cap 90" and bearing assemblies 63" and 69" may each be longitudinally adjusted with shims 91" and 92" which may be of ground plate and/or shim stock.

It has thus been demonstrated how the energy characterizing the half-integral spin nucleus can be utilized in a heat pump by altering the degrees of freedom of the crystal lattice structure. It is interesting to note that the assembly of atoms bound together by local inter-atomic forces to make up this crystal lattice structure is capable of vibration in a large number of independent

normal modes about the static equilibrium configuration. In these vibrations is stored a large portion of the enthalpy of the solid, and hence the vibrations are believed to make the major contribution to the specific heat. The vibrational energy is quantized so there is recognized to be some zero-point motion even at 0° K.

While the inventive concept has been specifically demonstrated as applied to utilization in heat pumps, it will now be evident that the energy which characterizes the half-integral spin nucleus in fact provides a generally usable new tool for producing interactions among atomic structures and is in no way limited or restricted to such use in heat pumps or similar devices.

I claim: [Claims not included here]

Edmund T. WHITTAKER Scalar Potential Functions

Mathematische Annalen **57: 333-356 (1903) ~**

"On the Partial Differential Equations of Mathematical Physics"

Page: 333 ~ 334 ~ 335 ~ 336 ~ 337 ~ 338 ~ 339 ~ 340 ~ 341 ~ 342 ~ 343 ~ 344 ~ 345 ~ 346 ~ 347 ~ 348 ~ 349 ~ 350 ~ 351 ~ 352 ~ 353 ~ 354 ~ 355 ~ 356

Proceedings of the London Mathematical Society, **Series 2, Vol. 1 (No. 843): 367-372 (1904) ~**

"On An Expression of the Electromagnetic Field Due to Electrons by Means of Two Scalar Potential Functions"

Page: 367 ~ 368 ~ 369 ~ 370 ~ 371 ~ 372